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# Residential Building Code Training

including:  
2003 International Residential Building Codes  
Clark County building code requirements  
and application process

## **The following codes have been adopted:**

- 2003 International Building Code
- 2003 International Residential Code
- 2003 International Mechanical Code
- 2003 Uniform Plumbing Code and Standards
- 2001 Washington State Energy Code
  - International Fuel Gas Code
  - International Fire Code
  - NFPA 54 and 58

All codes include state mandated Washington Administrative Code requirements.

June 19, 2004



## Presenters:

**Lou Adams, Chief Building Official**

Lou started his career as a pipefitter in the Navy in 1961. He has been in the industry for 44 years, 25 of them working at Clark County.

**Wendy Baird, Lead Community Development Specialist**

Wendy has been a Community Development Specialist for five years. She was recently promoted to a lead position.

**Wayne Folkers, Combination Building Inspector II**

Wayne has always been interested in building things whether it is an old muscle car or something interesting out of wood. So it is not surprising that he has spent the past 23 years in the building industry. Wayne has worked for the county for the past year and a half.

**John Greenheck, P.E., Structural Engineer**

John has been with the county for just over one year. He graduated from Montana State University and worked in consulting for over three years. John is a Registered Professional Engineer in Washington and California.

**MK Lawler, Combination Building Inspector II**

MK started in the Building Division four years ago. She earned all of her certifications within 18 months.

**Pat Lawler, Combination Building Inspector II**

Pat has been in the industry for 30 years, spending the last two at Clark County. He was a Washington State licensed contractor for 25 years. Currently, Pat is chairman for the Southwest Washington Chapter of the International Code Council.

**Lou Malattia, Lead Plans Examiner**

Lou worked as a licensed architect and building contractor in California. He enjoyed being a designer/builder. He was hired by Clark County 14 years ago.

**David Maret, Combination Building Inspector II**

David has contributed 15 years in the trades and eight years in inspection. He began working with the county four years ago.



**Vern Perry, Lead Building Inspector**

Vern has spent the 45 years working in this industry, the last 13 here in the Building Division. His son, Jim, has followed in his footsteps and also works in the building industry.



**John Weber, Plans Examiner**

John began his career in the building industry 35 years ago spending the last 14 at Clark County. He is a licensed master to 100tons; a Vietnam Veteran, Lt. Jg. USNR; a licensed tax professional; a federal law student;

and a licensed pilot. John was a licensed contractor in the area for 16 years.



**Mike Schelling, Building Inspector and Plans Examiner**

Mike has grown up in a construction oriented family which has given him the ability to do his job with confidence and understanding. He has

worked for Clark County for 10 years and in construction for 25 years.

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**Special thanks to:**

Teresa Guise, Commercial Plans Examiner  
William Platt, Residential Plans Examiner  
Désirée de Monyé, Department Web/Publications Coordinator  
Amber Coonradt, Office Assistant II

**Contact Information:**

Clark County Community Development  
Building Division  
Public Service Center, First and Third Floor  
1300 Franklin Street  
Vancouver, WA

Phone: (360) 397-2375      Web site: [www.clark.wa.gov/commdev](http://www.clark.wa.gov/commdev)

Permit Center hours:  
Monday, Tuesday, Thursday, Friday: 8:00 a.m. to 4:30 p.m.  
Wednesday: 10:00 a.m. to 4:30 p.m.

Building Inspectors are in the office between 7:30 a.m. and 8:30 a.m.

IVR system for inspection requests: (360) 397- 2477

## Contents / Agenda

### Introduction & Code Adoption

Presented by Lou Adams

### Facilitator: Mike Schelling

### Session One: General submittal requirements

Presented by Wendy Baird and David Maret

- Application and plot plan
- Setbacks, easements and PUD setbacks
- WUII (Wildland Urban Interface Intermix)
- Driveway approach
- Building Plans submittal requirements

### Session Two: Foundations, footings, and drainage

Presented by John Greenheck, Vern Perry, and Lou Malattia

- Structural design requirements, Geotechnical reports
  - Fill compaction tests
  - Conditions on site
- Finish grades, drainage, steep slopes
- Drainage
- Basement walls
- Foundations
- Typical Foundations
- Step Footings
- Retaining walls
- Engineering

### Session Three: Framing, beams, and decks

Presented by Lou Malattia and Pat Lawler

- Deck lateral stability and construction details
- Framing tables
- Blocking
- Connections
- Roof framing
- Fasteners

## **Session Four: Prescriptive Design**

Presented by John Greenheck

Unusual shape  
Cantilever floors  
Prescriptive braced wall panels  
Clark County alternate braced wall details

## **Session Five: Life –Safety Provisions**

Presented by Vern Perry, MK Lawler, David Maret, Wayne Folkers

Location on Lot  
Dwelling separation  
Glazing  
Light, ventilation and heating  
Emergency escape windows,  
Means of egress, stairs, landings, doors and guards  
Smoke alarms

## **Session Six: Energy Code**

Presented by John Weber

The latest 2003 WSEC  
The prescriptive requirements  
Foam insulation  
Component performance  
Ventilation and Indoor Air Quality Code

## **Reference materials**

## Section One: General submittal requirements

Presented by Wendy Baird and David Maret



### ***RESIDENTIAL PERMIT SUBMITTAL CHECKLIST***

**For a fully complete application the following must be submitted:**

1. **Application Form**
2. 2 sets of **complete Building Plans** conforming to the 2003 International Residential Code.  
✓ Drawn to a 1/4 inch scale
3. 1 copy (duplicate form) of the **completed Energy Code Window Schedule Form**. This form is available at the Permit counter, the Information Center at 1300 Franklin Street, 1<sup>st</sup> Floor of the PSC Building and the Battle Ground Office.
4. If the parcel is not located within a recorded subdivision or short plat; we will need 1 copy of the **recorded sales history from 1969 to the present** (the date the current State Land Division legislation was adopted).

Or

**Recorded copy of the current owners deed**

Sales history consists of recorded deeds, and any other documents, which form a **complete history** of all conveyances affecting the subject property. *Sales history packages may be obtained from any local Title Company. State law prohibits the issuance of permits on property that has been illegally created.*

5. **2 plot plans on 8 1/2 x 11** (see attached plot plan checklist for guidelines)
  - ◆ Book & page number of the plat, and a lot number of the parcel if located within a recorded **subdivision or short plat**. (*drawn to scale*) This information can be found on the current deed, or Quarter Section map.
  - ◆ Location of **Legal Access** from the subject property out to a County road if access is proposed via a private road easement
- **ZONING APPROVAL** (including assigned address) from the appropriate city if the site is located within Town of Yacolt (Town Hall, 105 Yacolt Road 686-3922). Zoning approval consists of your plot plan with an approval stamp or signature from the appropriate city official, or a letter from the city indicating approval of the project. **Clark County provides zoning review for those sites in unincorporated Clark County.**
6. A Check or Cash for plan review fee.

**IF ANY REQUIRED INFORMATION IS MISSING, YOUR PERMIT  
APPLICATION CANNOT BE ACCEPTED**


***Prior to issuance of the building permit, some may apply:***

- ❖ 1 copy of the **Contractor's valid Washington State License** may be required if our system shows the license is expired.
- ❖ A **Certified Erosion Control Person** who has taken the class through the Clark County Home Builders Association. (360) 694-0933
- ❖ A copy of the **septic tank permit or release letter** from the Clark County Health District. (1950 Fort Vancouver Way 397-8428) Or verification of **sewer availability** from Hazel Dell Sewer District. (8000 NE 52<sup>nd</sup> Ct 750-5876) or City of Vancouver (1313 Main St. 696-8101).
- ❖ The identity and **approval of the water supplier:**
  - A. If the residence is to be serviced by a private well, the well must be installed, the water tested, and a **"W.A.V.E"** letter from the Clark County Health District needs to be submitted prior to permit issuance.
  - B. If the residence it to be served by a well serving more than one residence, you must provide a copy of a **"community well"** approval with a copy of the **"W.A.V.E"** letter from Clark County, Environmental Health Services,
  - C. If the residence it to be served by a **public water system**, and is not located in a recorded subdivision, you must provide a letter of approval from the appropriate water agency.
- ❖ **Electrial Permits**  
Washington State Labor & Industries located at 312 SE Stonemill Dr., Ste 120 Vancouver WA 98684 (360) 896-2371

Clark County Building Department is located at 1300 Franklin St., 1<sup>st</sup> Floor PSC Building  
Vancouver WA (360) 397-2375.

Our Satellite Office is located at 701 E. Main St.  
Battle Ground WA (360) 687-7126 x 211

# Residential Building Code Training

<b>Residential Building Permit Application</b> Revised 3/06/02 Permit Number: _____			
Owner Name: _____			
Applicant Name: _____			
Applicant Address: _____			
Applicant Phone: _____		Applicant Fax: _____	
Applicant Email Address: _____			
Are you: <input type="checkbox"/> Owner <input type="checkbox"/> Contractor <input type="checkbox"/> Consultant <input type="checkbox"/> Developer <input type="checkbox"/> Other: _____		Contractor/Builder Name: _____  Phone: _____  Certified Erosion Control Person: _____	
<b>Application Type:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> New Single Family Residential  <input type="checkbox"/> Mobile Home Placement  <input type="checkbox"/> Residential Addition  <input type="checkbox"/> Accessory Building (i.e., garage, shop, barn, outbuilding)  <input type="checkbox"/> House Move  <input type="checkbox"/> Interior Only  <input type="checkbox"/> Other: _____         </div> <div style="width: 50%;"> <input type="checkbox"/> Same-as Plan # _____   <input type="checkbox"/> One Story  <input type="checkbox"/> Two Story  <input type="checkbox"/> Basement - Fin  <input type="checkbox"/> Basement - Unfin  <input type="checkbox"/> Attached garage         </div> <div style="width: 50%;">           Type of heat:  <input type="checkbox"/> Electric  <input type="checkbox"/> Natural Gas  <input type="checkbox"/> Other: _____         </div> <div style="width: 50%;">           Existing number of bedrooms: _____            Proposed number of bedrooms: _____         </div> </div>			
Do you need other permits? <input type="checkbox"/> Mechanical (furnace, gas piping, woodstove, heat pump) <input type="checkbox"/> Plumbing (water service, moving fixtures, lawn sprinklers) <input type="checkbox"/> Accessory Dwelling		Proposed New Square Footage: Finished: _____ Unfinished: _____ Basement Finished: _____ Basement Unfinished: _____ Garage: _____ Existing House Square Footage: _____ Deck square footage: _____ Deck valuation: _____	
Project Valuation: _____			
Project description: _____			
<b>Utilities:</b> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Septic System  <input type="checkbox"/> Sewer, District: _____         </div> <div> <input type="checkbox"/> Private Well  <input type="checkbox"/> Community Well  <input type="checkbox"/> Public Water, District: _____         </div> </div>			
<b>Property Location:</b> Address: _____			
Subdivision Name (if applicable): _____		Lot Number or Parcel Number: _____	
<b>Staff to complete. Environmental Constraints:</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%;"> <input type="checkbox"/> Archaeological  <input type="checkbox"/> Geologic Hazard  <input type="checkbox"/> Habitat  <input type="checkbox"/> CARA         </div> <div style="width: 33%;"> <input type="checkbox"/> Floodplain  <input type="checkbox"/> Shoreline  <input type="checkbox"/> Wetlands/Hydric Soils  <input type="checkbox"/> Wildlife Interface Area         </div> <div style="width: 33%;"> <input type="checkbox"/> SEPA  <input type="checkbox"/> Columbia Gorge Scenic Area  <input type="checkbox"/> Forest Practice  <input type="checkbox"/> None         </div> </div>			
Applicant Initials: _____		Staff Initials: _____ Current Zoning: _____	
Applicant/Authorized Signature _____		Date _____	



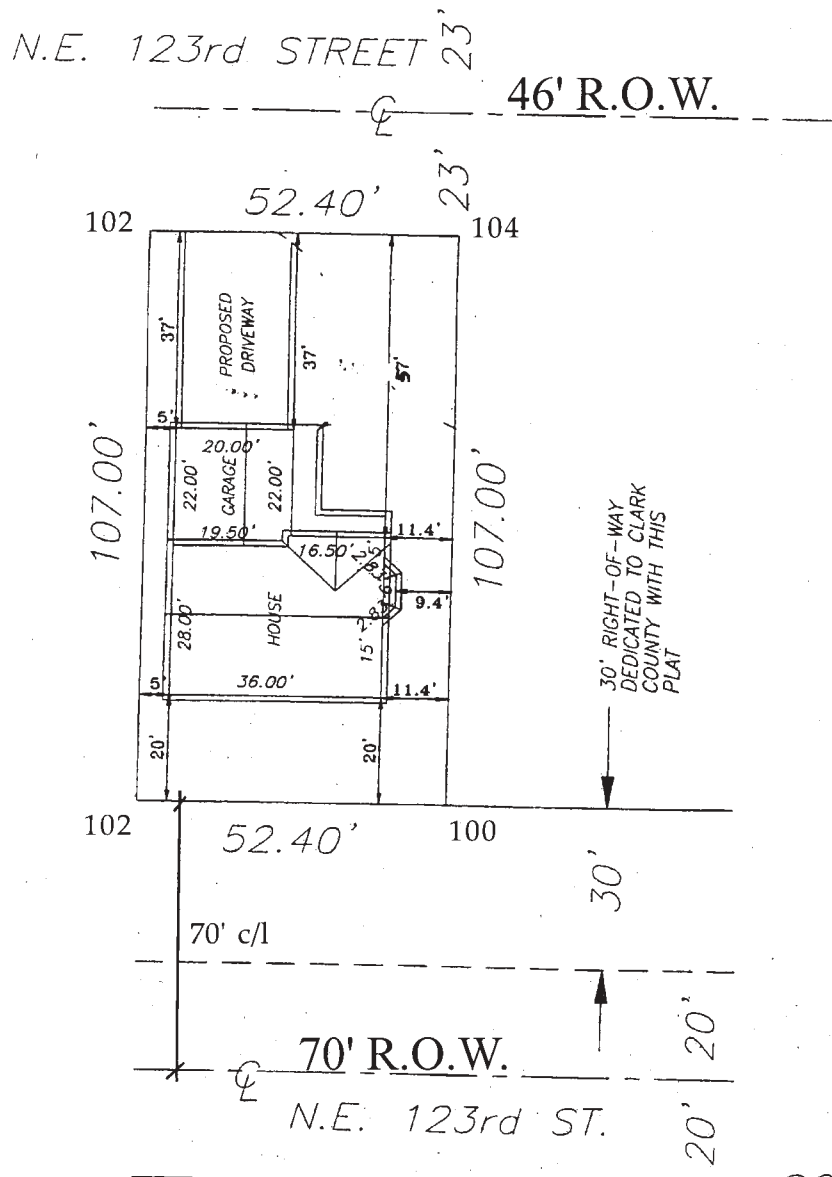
## Plot plan checklist

- ☐ Plot plans must be **legible and drawn to scale** (If the lot is one acre or smaller). If the lot is over one acre, the plot plan must be drawn so the structures look proportionate to the property. We still need the standard requirements of setback dimensions, easement dimensions, septic location, drain field etc., placed on the plot plan. For lots over 1-acre in size we reserve the right to require the applicant to submit a plot plan to scale. Please make sure we let the customer know.
- ☐ The **scale** must be identified and the **North arrow** shown on the plot plans.
- ☐ All plot plans must show the **outside dimensions** of the property as represented on the recorded plat or on the current owners recorded deed.
- ☐ **Name** of subdivisions and **lot or parcel number** must be shown on the plot plan.
- ☐ **Driveway** location must be shown on the plot plan. The plot plan must show width and length of driveway as well as the distance from the driveway to the nearest interior side, public or private side street, or easement.
- ☐ All known **easements** must be shown on the plot plan with dimensions and labeled as to the type of easement.
- ☐ All **streets** must be labeled with street name.
- ☐ The **entire width** of the abutting street **right-of-way** and/or private road access must be shown.
- ☐ Plot plans must show the location and dimension of all **existing and proposed structures**. All projections such as eaves, bay windows, cantilevered upper floors, fireplaces, decks, covered porches, patio covers, etc. must be shown on the plot plan. Elevations and contour lines every 2' grade change.
- ☐ All structures must be clearly **labeled** as to existing and proposed uses (i.e. house, garage, shop etc).
- ☐ **Dimensions** from the nearest point of the new structure to all property lines, edge of easement's and where applicable to the centerline of the public or private road easement must be shown and drawn at a 90 degree angle (perpendicular) to the property line or edge of easement. The distance from the new proposed structure to any existing structures must be shown.
- ☐ For same-as applications, the **psk square footage** must match the application for the single family permit.
- ☐ The location of the **septic** and drain field must be shown including the reserve area.
- ☐ The location of the **well** or proposed well must be shown.
- ☐ All **environmental** areas must be addressed and the distance from the proposed structure to the sensitive area must be shown. All environmental areas must be labeled (i.e. Rock Creek, top or toe of slope (ask the applicant if they know the percentage of the slope), shoreline buffer, habitat, wetlands, forested area etc).
- ☐ Check Arc View to see if parcel is heavily treed. Verify with applicant if parcel has been logged within the last 6 years. If either is yes, send Clark County Forester a copy of the application and plot plan for possible **Forest Practice** requirements.
- ☐ All required **stamps** must be on plot plan and filled out with address and minimum setback requirements.
- ☐ If the plot plan is **not an accurate representation** of the lot or the improvements thereon, advise the applicant that it is not sufficient documentation and they will need to revise the information prior to application. Do not have the applicant cross items out. Allow the applicant to use white out.

[illegible]

# Plot plan in a subdivision

Lot # 4  
HOUSE PLAN 2,123



SCALE: 1"=30'

## Wildland Urban Intermix Interface Conditions

### General Information

- All mobile homes applications are sent to the Fire Marshal's Office for review.
- Same-As plans no longer permitted within Wildland Urban Intermix Interface (WUII).
- If plans are over 3600 square feet they are reviewed by the Fire Marshal's Office.

### Access

- Private driveways in excess of 150 feet in length shall be constructed and maintained in accordance with the following:
  - A minimum width of 12 feet clear, un-obstructed, all weather driving surface
  - An overhead clearance of 13'6"
- Private driveways over 300 feet shall be reviewed by the Fire Marshal.
- Bridges on access roads require a separate permit and comply with the current codes for live loading sufficient to carry fire apparatus.

### Setbacks

- No building shall be permitted within 30 feet of property lines, unless zoning designation is greater.
- A 30 foot defendable perimeter shall be required around all buildings.
- Fire Marshal may require additional defendable issues.

### Minimum Requirements

- No building shall be within 30 feet of property lines.
- All vegetation and combustible construction debris shall be removed from the site or disposed of in an approved manner.
- All dead wood and brush within 30 feet of a building shall be removed.
- All annual type grass within 30 feet of a building shall be cut and maintained at a height no greater than 4 inches.
- Trees within 30 feet of a building shall be limbed to a height of not less than 15 feet.
- Conifers (evergreens) shall not be located nor shall any portion thereof extend to within 15 feet of the furthest projection of a building roof line of horizontal combustible surface.
- In areas designated as Wild-land Urban Interface/Intermix by CCC 15.13.030, the underside of exposed horizontal combustible surfaces such as decks, balconies, or similar projections shall be completely enclosed with non-porous skirting consisting of metal, a minimum of ½" plywood, or other approved material where the height of the projection is 30 inches or less above the ground level.
- Roofing materials for new or replacement of existing roofs shall be limited to Class 'A' roofing or greater. Roofs with slopes less than 3:12 shall have non-combustible covering.
- Chimney outlets shall not be located within 15 feet of obstruction, vegetation, or other combustible materials.

- All solid fuel (wood stoves, pellet stoves, and chimney's) shall be provided with a spark arrestor.

## Fire Flow Requirements

A minimum of 500 gpm shall be required for all structure.

Any combination of the following may be used to meet the minimum 500 gpm requirements:

- Fire hydrant within 1000 feet of the building. Documentation of fire flow is required on hydrants.
- Provide class 'A' roofing for 250 gpm.
- District tanker certification for 250 gpm. Documentation is required
- 100% increase in defensible area around buildings for 250 gpm.
- Residential sprinkler system for gpm.
- 50% increase in defensible area around buildings for 125 gpm.
- All exposed surfaces are non-combustible for 125gpm.

## PUD Issues

### Clark County Code 40.200.070 Exceptions to setback requirements

A) Projections into required setbacks: Certain architectural features and structures may project into required setbacks as follows:

1. Side Setbacks: The following feature and structures may project into the required side setback not more than 2 feet; provided the width of such side setback is not reduced to less than 3 feet

- Cornices, canopies, eaves, belt courses, sills or other similar architectural features
- Fireplaces, and
- Uncovered open porches, decks, landings or stairways not more than 30 inches in height above the finished grade

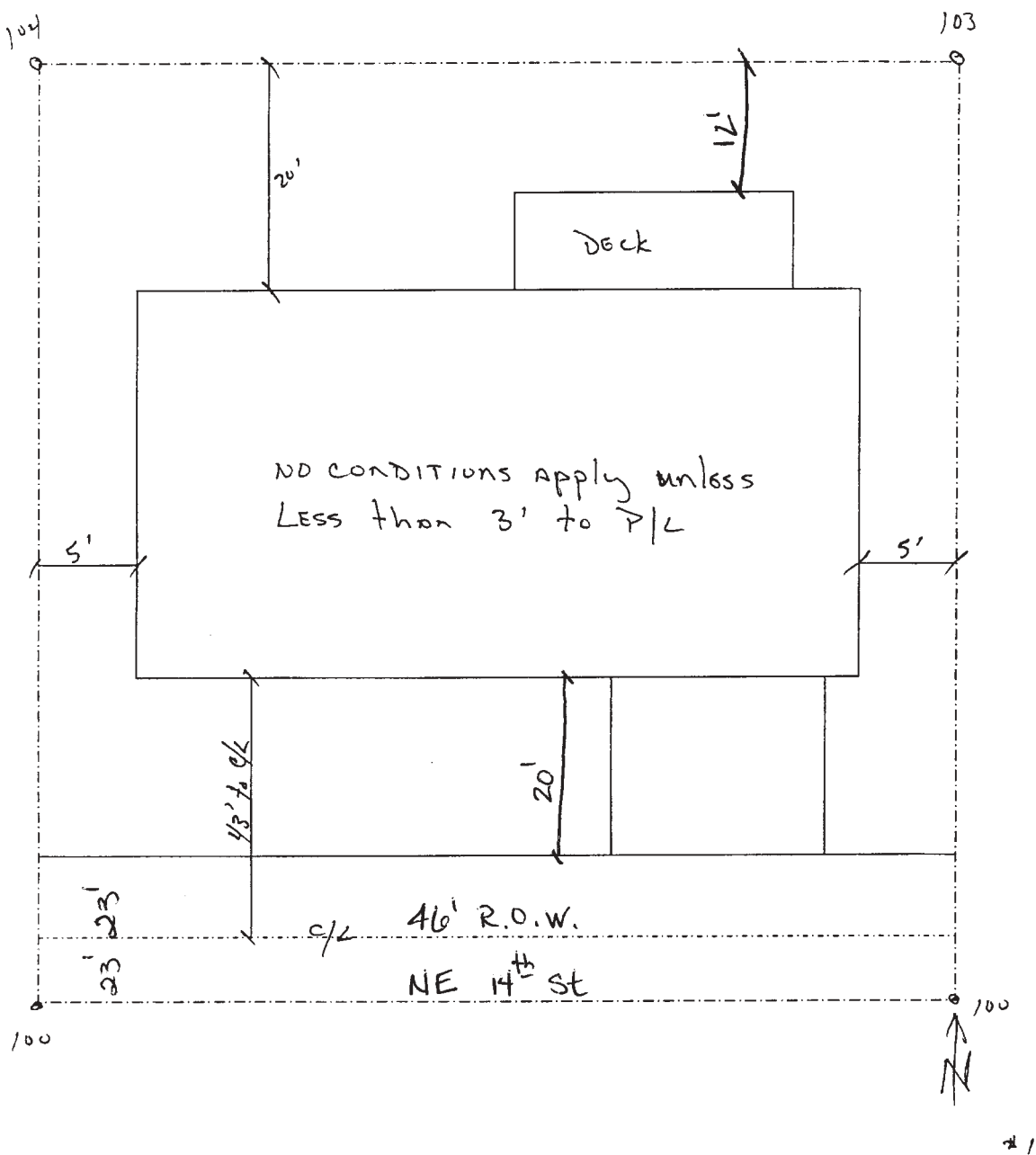
Projections into side setbacks shall not include living space such as bay windows or overhanging breakfast nooks, etc.

Up to the word 'PROVIDED' (in the text above at Section 40.200.070A (1) ) a two foot eave overhang is allowed. However once the yard is reduced to less than three feet to the property line by the projection, it cannot extend further into the required yard.

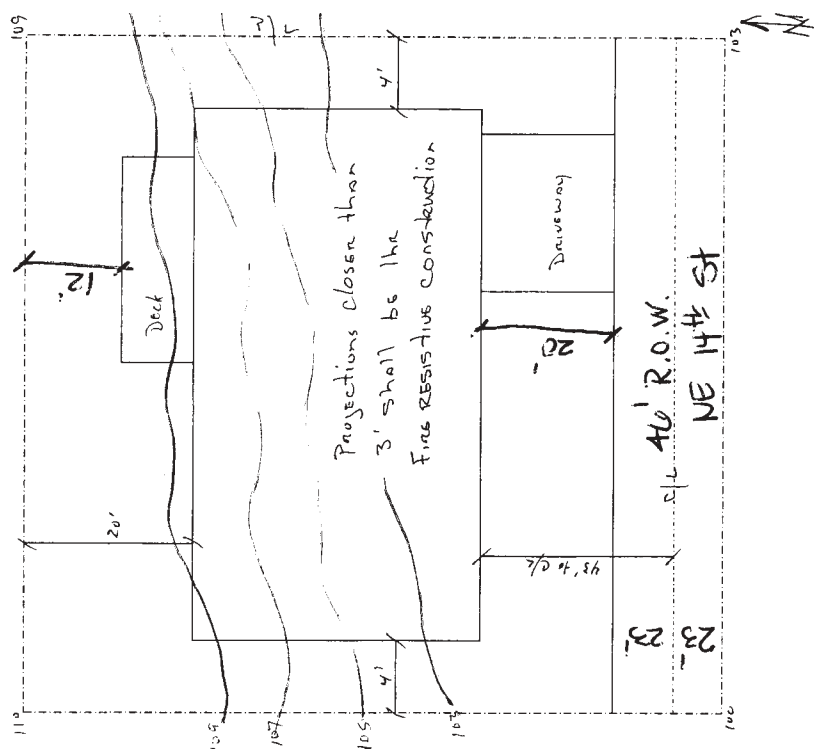
Where the required yard setback is only three feet to begin with, then additional building setbacks will have to be provided in order to accommodate building projections such as eaves, fireplaces, decks, etc. that may be desired.

**Setbacks**

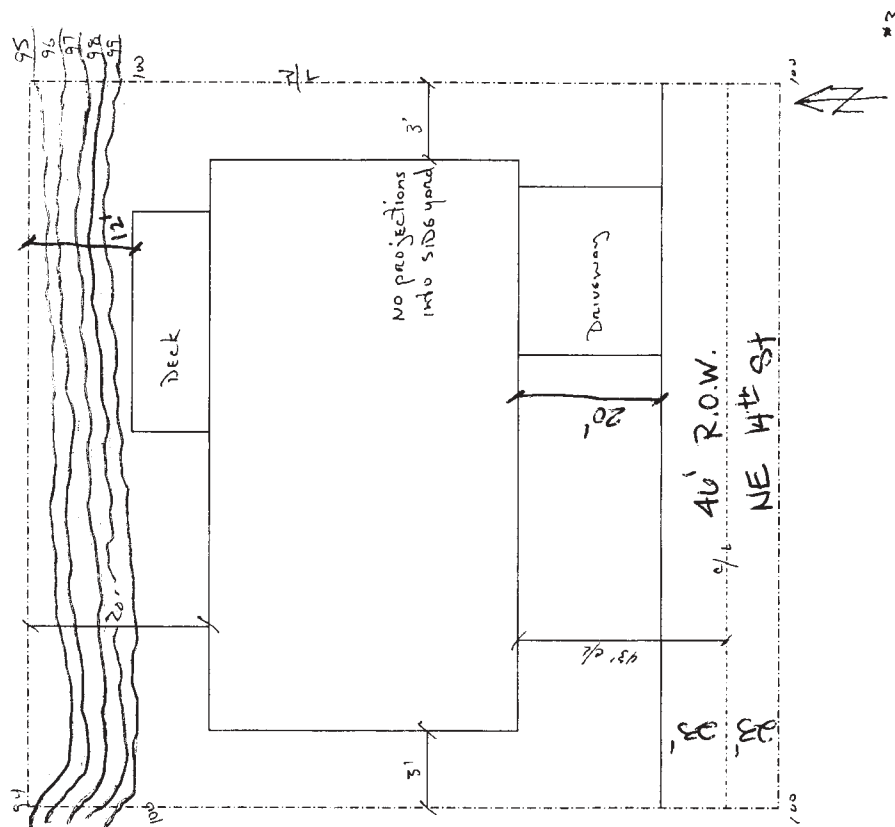
Standard



PWD



PWD



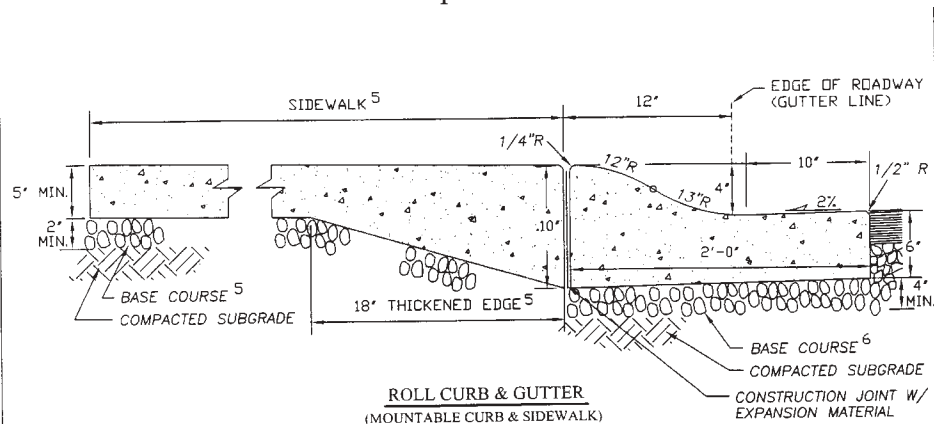
## Driveway Approaches

All driveway approaches are to meet minimum standards and ADA standards.

There are three types of approaches approved for residential and are as follows:

1. Rolled curbs
2. Type 3
3. Type 1 with planter strip

The following details illustrate the minimum requirements that shall be followed.



### NOTES

1. CONCRETE SHALL BE 3000 PSI MIN. (CLASS 3000) 3 1/2" SLUMP (MAX.)
2. CURBS ADJACENT TO PAVEMENT OR SIDEWALK TO HAVE EXPANSION AND/OR CONTRACTION JOINTS TO MATCH EXISTING PATTERNS.
3. 3/8" EXPANSION JOINTS TO BE PROVIDED AT EACH POINT OF TANGENCY OF THE CURB, COLD JOINTS, EACH SIDE OF INLET STRUCTURES AND DRIVEWAYS. MATERIAL TO BE PRE-MOLDED, ASPHALT IMPREGNATED AND NON EXTRUDING.
4. CONTRACTION JOINT SPACING NOT TO EXCEED 15 FEET. THE DEPTH OF THE JOINT SHALL BE AT LEAST 1-1/2 INCHES.
5. THICKENED EDGE SIDEWALK SHALL BE PLACED ON 2" (MIN.) CRUSHED AGGREGATE (5/8"-0). SUBGRADE AND BASE COURSE COMPACTED TO 95% MAX. DRY DENSITY.
6. BASE COURSE UNDER ROLL CURB & GUTTER SHALL BE TO SUBGRADE OF STREET SECTION OR 4 INCHES, WHICHEVER IS GREATER, AND SHALL EXTEND 6" BEHIND THE CURB.
7. CURB DRAINS ARE TO BE AVOIDED WITH ROLL CURB & GUTTER. THE AVAILABILITY OF CONNECTION TO AN EXISTING OR ALTERNATIVE DRAINAGE SYSTEM MUST BE EXHAUSTED BEFORE CURB DRAINS WILL BE CONSIDERED. SEE STD. PLAN 18C FOR ROLLED CURB PENETRATION DETAIL FOR ROOF AND FOOTING DRAINS.
8. CURB TO BE BRUSH FINISHED. ALL EXISTING EDGES SHALL BE SAWCUT.
9. USE OF ROLL CURB & GUTTER WITH COMMERCIAL DRIVEWAYS WILL REQUIRE REINFORCING STEEL (6"x6"x10 GA. MESH) MIN. 3" COVER.

DWG: 18.DWG



Department of  
Public Works  
**CLARK COUNTY**  
WASHINGTON  
proud past, promising future

CONCRETE ROLL CURB & GUTTER  
(MOUNTABLE CURB & SIDEWALK)

APPROVED

COUNTY ENGINEER

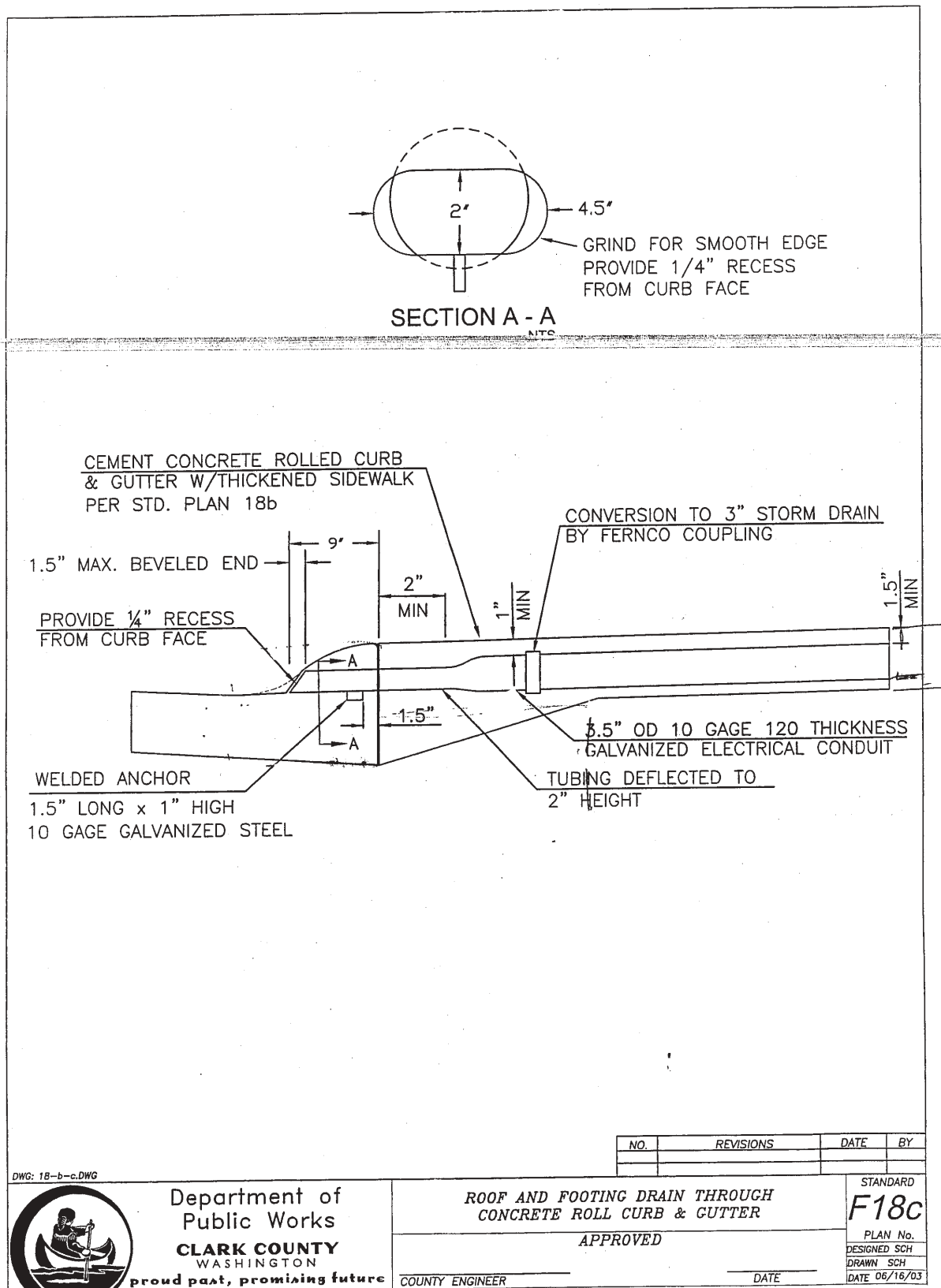
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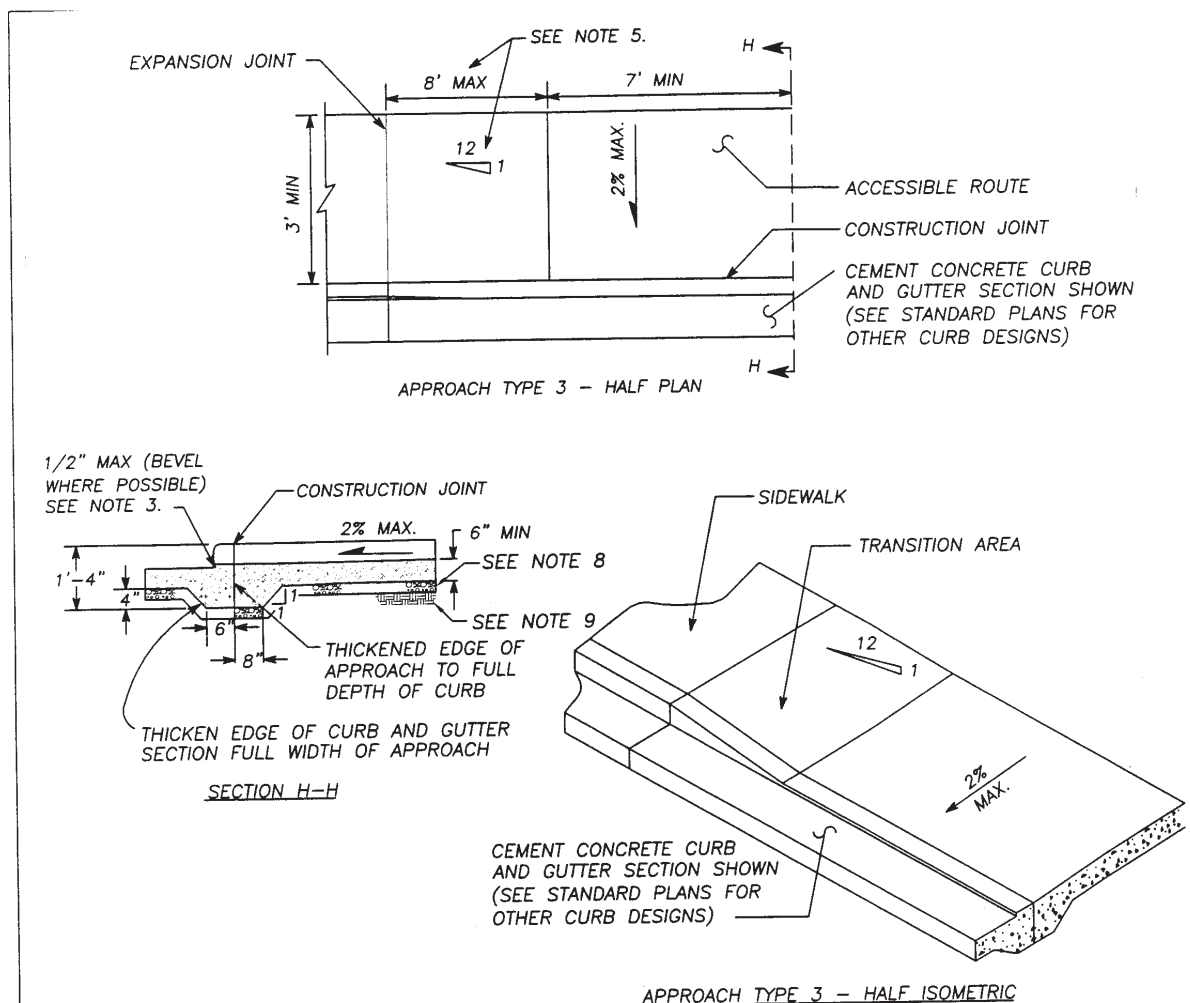
STANDARD

**18b**

PLAN No.  
DESIGNED SCH  
DRAWN: SCH  
DATE 07/24/0







## NOTES:

1. A MINIMUM 3' WIDE ACCESSIBLE ROUTE SHALL BE MAINTAINED IN ALL PEDESTRIAN ACCESSIBLE AREAS.
2. CONTRACTION JOINTS SHALL BE PLACED ALONG SIDEWALKS IN ACCORD WITH SIDEWALK DETAIL. ALL JOINTS SHALL BE CLEANED AND EDGED.
3. CHANGES IN LEVEL UP TO 1/4" MAY BE VERTICAL AND WITHOUT EDGE TREATMENT. CHANGES IN LEVEL BETWEEN 1/4" AND 1/2" SHALL BE BEVELED WITH A SLOPE NO GREATER THAN 2:1.
4. TRANSITION AREA TO BE SLOPED AT 1v TO 12h, UNLESS STREET GRADE WOULD CREATE A TRANSITION LENGTH GREATER THAN 8', THEN THE MAXIMUM LENGTH OF 8' GOVERNS SLOPE.
5. CEMENT CONCRETE APPROACHES SHALL BE CONSTRUCTED OF AIR-ENTRAINED CONCRETE CLASS 3000 AND MAY BE POURED INTEGRAL WITH CURB.
6. EXISTING CURB, GUTTER AND SIDEWALK TO BE SAWCUT AND REMOVED FOR INSTALLATION OF APPROACH.
7. COMMERCIAL DRIVEWAY REQUIRES REINFORCING STEEL (6"x6"x10 GA MESH) MIN. 3" COVER.
8. 3" DEPTH 3/4"-0 CRUSHED AGGREGATE BASE COMPACTED TO 95% OF MAX. DRY DENSITY.
9. SUBGRADE PREPARED PER WSDOT STD. SPEC. 2-06.3(1)

NO.	REVISIONS	DATE	BY
1	NOTE # 7, 8, 9	7/24/02	SCH

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Department of Public Works

CEMENT CONCRETE APPROACH  
DETAIL - TYPE 3

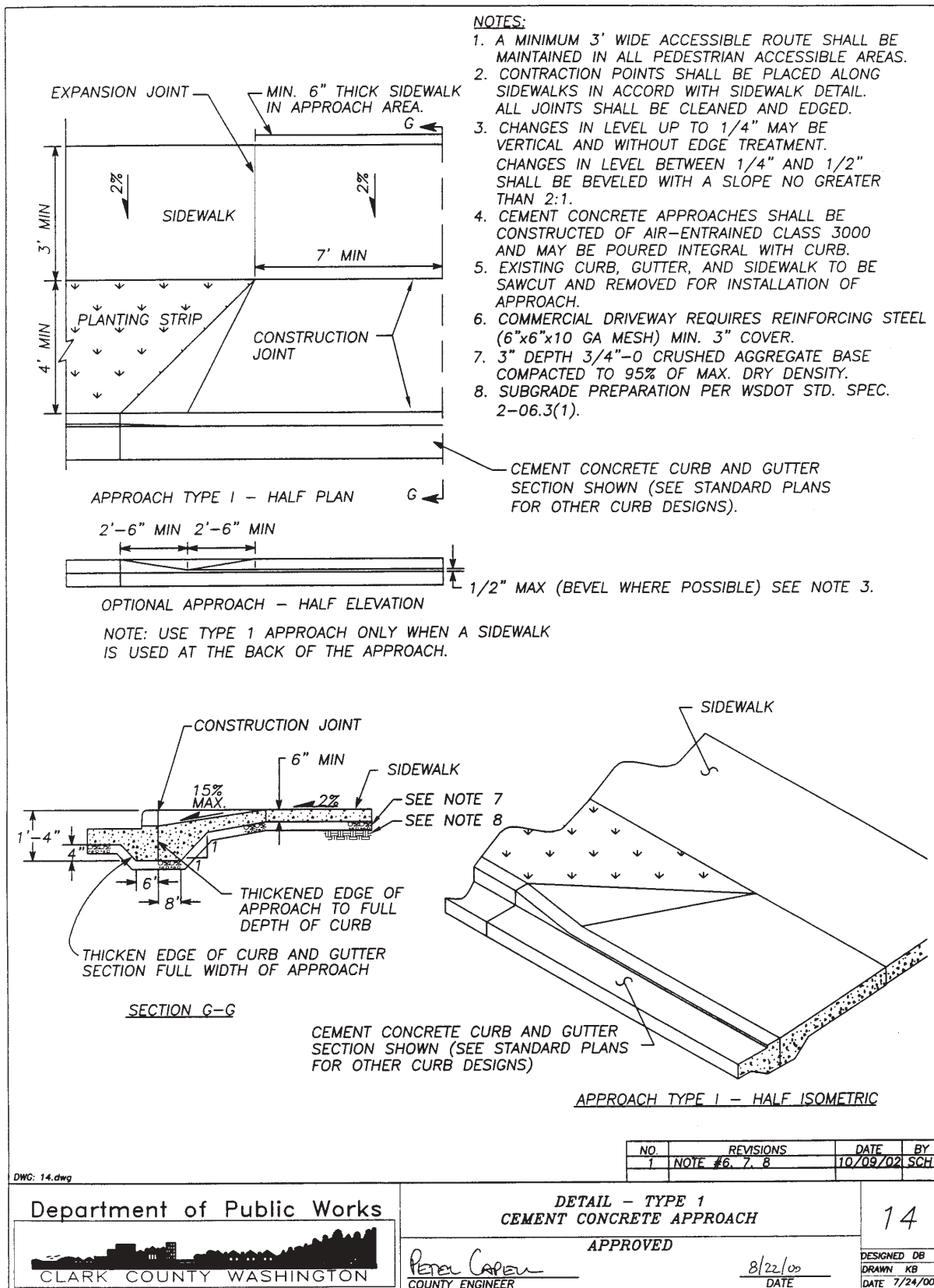
APPROVED

*Peter Capen*  
COUNTY ENGINEER

8/22/05  
DATE

16

DESIGNED DB  
DRAWN KB  
DATE 7/24/00



## Residential Plan Review Submittal Requirements

**Complete set of plans:** Plans shall show specifically what is being built. A complete set of plans consists of:

**Foundation plan** shall show code prescriptive lateral requirements or engineering design.

The plan shall also show dimensions, anchor bolts, bearing pads, and vents. If using a wood floor, show joists, girders, posts, and specify all required connectors and hangers. Indicate interior bearing points and walls. Details shall be provided to adequately show construction per code or engineering.

**Basement and retaining wall** details shall note and show code requirements. Engineer's calculations shall be provided for retaining walls. Foundation details accepted by jurisdiction may be used.

**Floor plan** label use of each room; show dimensions, window sizes, smoke detectors, appliance locations, ventilation fans, plumbing fixtures, decks, and balconies with code prescriptive lateral brace panels or engineered design.

**Wall Bracing** for code prescriptive lateral or engineered design shall be provided on plans, shown on full size sheets, indicating details, locations, and load path connections. Engineered design shall also provide calculations and specifications. For prescriptive design, provide appropriate code section and/or table.

**Floor framing plan** shall be included on plans and identify framing components used including joist grade, size, spacing, and connectors. Show all headers and beams. If using manufactured floor system, provide manufacturer's layout and specifications.

**Roof framing plan** shall be included on plans and identify framing components used. Show all beams and headers required. Include interior bearing points or walls. If using engineered trusses, show trusses on roof framing plan and provide manufacturer's layout and engineering which shall include required hangers and connectors for all load including vertical uplift.

**Cross-Section and details** provide at least two full cross sections (in different directions) through entire building showing framing members, sizes, spacing, headers, joists, sub-flooring, wall construction components, and roof components. Indicate location of cross-section on floor plan. Details of walls, floors, roofs, stairs, fireplaces, and foundations shall be on plans.

**Elevations** provide all exterior elevations. Elevations shall show actual finish grade (if greater than 2' grade change). Show steps in foundation walls and retaining walls. Provide drainage plan when required.

**Energy Code** requirements shall be shown on plans. If using a spray-on foam insulation system for floor, walls and roof, provide an approved system analysis report for review during plan review. Identify ventilation requirements and how they are being provided.

## SAME-AS PLANS REQUIREMENTS

**Effective July 1, 2004** the following rules and regulations will apply to the Same-as fast track process:

Application must be complete:

Submit two copies of building plans, one original copy of the window schedule form and two copies of a plot plan if applying for a building permit. If applying for a plan check only plot plans are not required). See "*Residential Application Checklist*" for building plan and site plan requirements.

Same-as requirements:

1. Definition: Same-as plans are plans that have been submitted and approved for repeated use for six months of date of last issuance with the building division in recorded subdivisions that are less than 3,600 sq. ft. (not including garage) single family dwelling occupancies with no part less than three foot from property line.
2. No Same-as plan allowed when W.U.I.I. conditions apply.
3. Same-as plans shown as flat lots must have finish grade change of not more than two feet. Same-as plans for sloped lots are permitted only if same lot conditions will be replicated.
4. Engineering is required to be site specific. Applicant must provide a letter *or new cover page with a wet signed engineering stamp* from the engineer of record that displays the plan as being designed as a PCK, or for *specific lots of a subdivision*, or site specific *engineering*. Any change in finish grade of more than two (2) feet will require a new Same-as plan and engineering.
5. Building plans shall be on standard 24"x36" paper drawing at a 1/4" =1'-0" scale. Plan must be original drawing with no changes or markings or small sheets attachments or changes. No mirror images. Clean set of not previously used plans.
6. No alterations or options: Except for bay windows and two to three car garages. These must be shown as options on the first time review. The first time through you will pay for the higher square footage, after the first review you will pay for the square footage on the garage as two or three bays. Any other changes will result in a separate permit and plans will be required. Basements are not a permitted option. A separate permit and plan review will be required.
7. Same-as plans must be posted on the job site.

**Fees on Same-as Plans:** The first time through will be a full plan check fee. Subsequent applications will be charged at 1/2 the plan review fee.

**Time Frame on Same-as Plans:** Depends on workload.

**Time Frame on Building Permits W/ approved Same-as:** May be at least one-week turnaround. In some cases they may be issued over the counter if only applying for one or two applications depending on customer flow at time of application and if in a recorded subdivision or short plat and if there are no holds or problems with the plats.

## Section Two: Foundations, footings, and drainage

Presented by John Greenheck, Vern Perry, and Lou Malattia

### Structural design requirements

#### Engineering Design Criteria

Table R301.2(1)

Wind speed: 110 Mph, 3 second gust

Seismic: Zone D1

Snow: Minimum Roof snow load 25 psf

Allowable bearing pressure: 1500 psf without a geotechnical report

#### Geotechnical Reports

Prepared by Washington Licensed Geotechnical Engineer or Geologist

Geologic history of area

Slope and stability requirements and recommendations

Piers required?

Minimum footing embedment

Competent Bearing Soil?

If not, what is required?

Fill?

Allowable Bearing Pressure

If allowable bearing pressure is less than 1500 psf, footing sizes will have to be modified

Soil Type

Drainage Recommendations

Where to terminate drainage

#### Fill Compaction Tests

Bearing capability analysis

Is the fill suitable for type of structure

What is the bearing capacity

What are the compaction requirements

#### When is Engineering required?

Building within the slope set backs

R403.1.7: The placement of buildings and structures on or adjacent to slopes steeper than 1 unit vertical in 3 units horizontal (33.3 percent slope) shall conform to sections R403.1.7.1 through R403.1.7.4

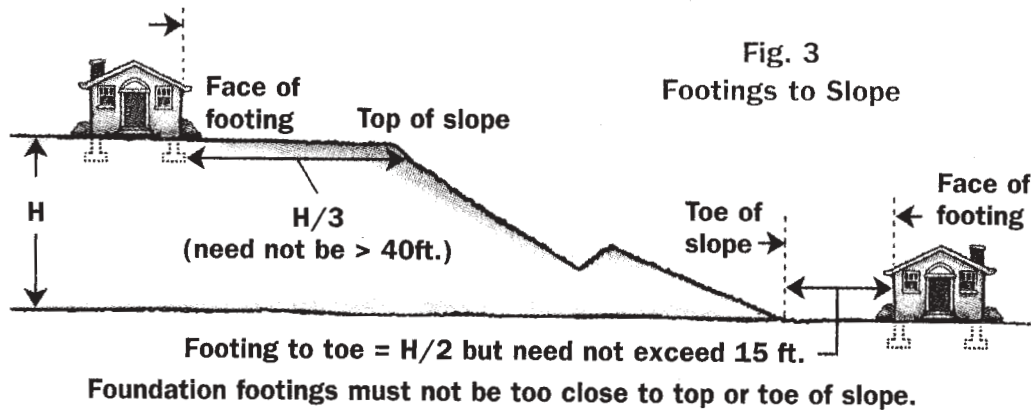
**See Figure R403.1.7.1** (Foundation Clearances From Slopes)

Building clearances from ascending slopes:

- In general, buildings below slopes shall be set a sufficient distance from the slope to provide protection from slope drainage, erosion and shallow failures.
- Building clearances per figure R403.1.7.1 shall be assumed to meet this criteria

Building clearances from descending slopes;

- Footings on or adjacent to slope surfaces shall be founded in material with an embedment and setback from the slope surface sufficient to provide vertical and lateral support for the footing without detrimental settlement
- Building clearances per figure R403.1.7.1 shall be assumed to meet this criteria



## R403.1.7

### Footings on or adjacent to Slopes

When walls have a surcharge (road, driveway, etc.)

Typical basement wall will not apply

When walls have surcharge from grades with slopes greater than 2:1

Unrestrained (cantilever) retaining walls retaining more than 4 feet of back fill

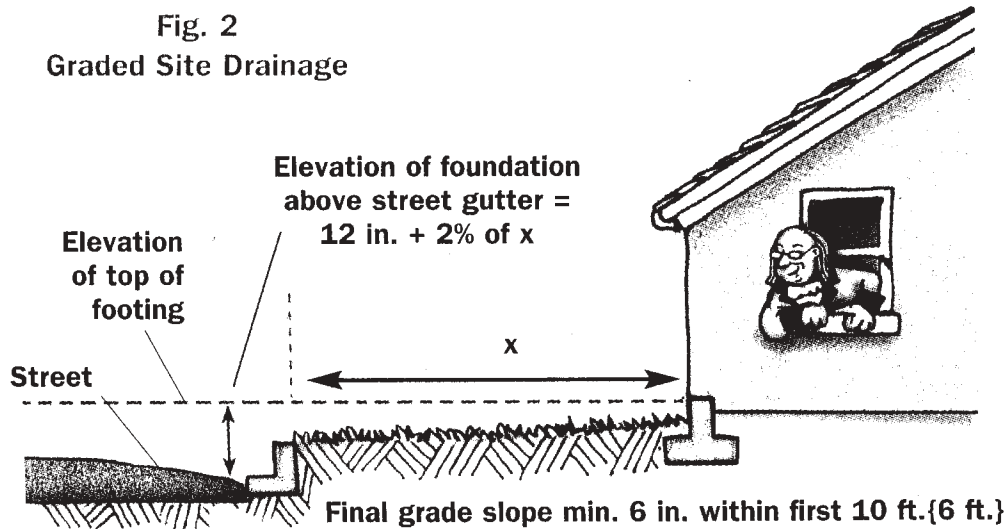
Building located within Flood plains – FEMA maps

Areas of known slide activity & hazardous locations

Per County maps & GIS

## Conditions on site

**R403.7.7.3 Foundation elevation.** On graded sites, the top of any exterior foundation shall extend above the elevation of the street gutter at point of discharge or the inlets of an approved drainage device a minimum of 12 inches (305 mm) plus 2 percent. Alternate elevations are permitted subject to the approval of the building official, provided it can be demonstrated that required drainage to the point of discharge and away from the structure is provided at all locations on the site.



## Foundation Elevation 403.9.73

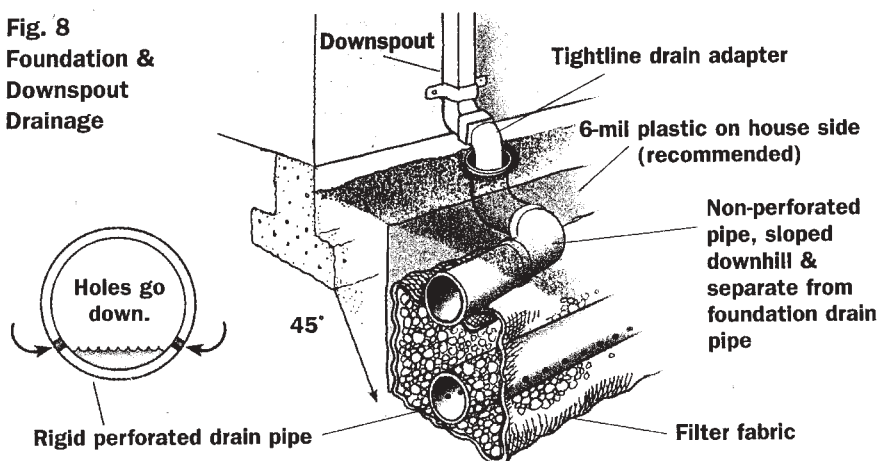


## SECTION R405 FOUNDATION DRAINAGE

**R405.1 Concrete or masonry foundations.** Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade. Drainage tiles, gravel or crushed stone drains, perforated pipe or other approved systems or materials shall be installed at or below the area to be protected and shall discharge by gravity or mechanical means into an approved drainage system. Gravel or crushed stone drains shall extend at least 1 foot (305mm) beyond the outside edge of the footing and 6 inches (153 mm) above the top of the footing and be covered with an approved filter membrane material. The top of open joints of drain tiles shall be protected with strips of building paper, and the drainage tiles or perforated pipe shall be placed on a minimum of 2 inches (51 mm) of washed gravel or crushed rock at least one sieve size than the tile joint opening or perforation and covered with not less than 6 inches (153 mm) of the same material.

**Exception:** A drainage system is not required when the foundation is installed on well-drained ground or sand-gravel mixture soils according to the Unified Soil Classification System, Group I Soils, as detailed in Table R405.1.

**Fig. 8**  
**Foundation &**  
**Downspout**  
**Drainage**



## 405.1 Foundation Drainage

## Typical Foundation under the IRC

Minimum compressive strength of concrete 2500 PSI Table R402.2

Clark County prescriptive soils load bearing pressure 1500 PSF

TABLE R401.4.1  
PRESUMPTIVE LOAD-BEARING VALUES OF  
FOUNDATION MATERIAL

CLASS OF MATERIAL	LOAD-BEARING PRESSURE (pounds per square foot)
Crystalline bedrock	12,000
Sedimentary and foliated rock	4,000
Sandy gravel and/or gravel (GW and GP)	3,000
Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000
Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CI, ML, MH and CH)	1,500

For SI: 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- a. When soil tests are required by Section R401.4, the allowable bearing capacities of the soil shall be part of the recommendations.
- b. Where the building official determines that in-place soils with an allowable bearing capacity of less than 1,500 psf are likely to be present at the site, the allowable bearing capacity shall be determined by a soils investigation.

## FOOTINGS R403

### Section R403.1

- Minimum sizes for concrete and masonry footings shall be as set forth in Table R403.1 and Figure R403.1(1).
- The footing width,  $W$  shall be based on the load-bearing value of the soil in accordance with Table R401.4.1.
- The size of footings and supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1. (1500 PSF)

**TABLE R403.1**  
**MINIMUM WIDTH OF CONCRETE OR MASONRY FOOTINGS**  
**(INCHES).**

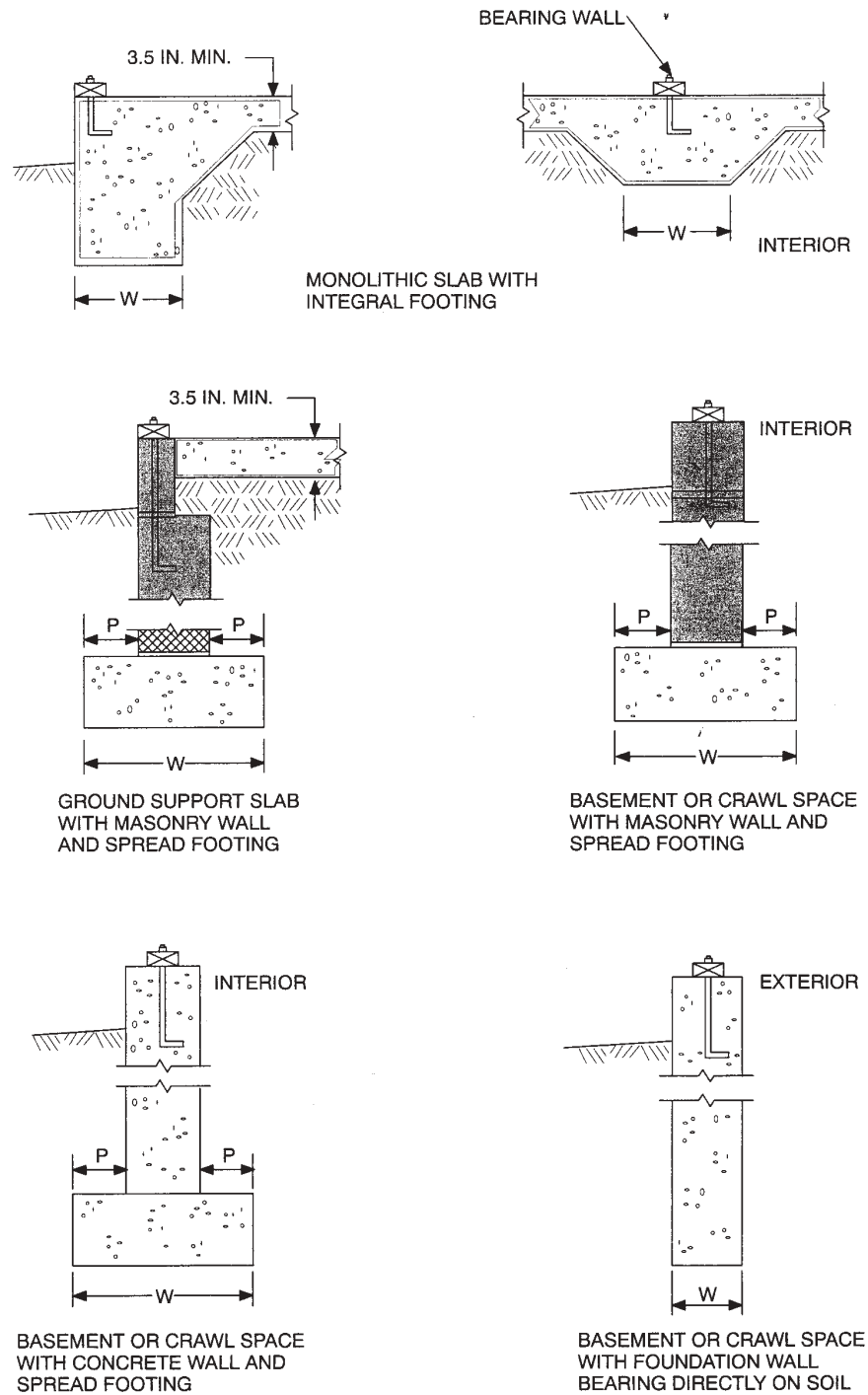
	LOAD-BEARING VALUE OF SOIL (psf)			
	1,500	2,000	3,000	≥4,000
<b>Conventional light-frame construction</b>				
1-story	12	12	12	12
2-story	15	12	12	12
3-story	23	17	12	12
<b>4-inch brick veneer over light frame or 8-inch hollow concrete masonry</b>				
1-story	12	12	12	12
2-story	21	16	12	12
3-story	32	24	16	12
<b>8-inch solid or fully grouted masonry</b>				
1-story	16	12	12	12
2-story	29	21	14	12
3-story	42	32	21	16

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>

a. Where minimum footing width is 12 inches, a single wythe of solid or fully grouted 12-inch nominal concrete masonry units is permitted to be used.

- Foundations with stem walls min. one #4 bar at the top of the wall and one #4 bar at the bottom of the footing. R403.1.3.1
- Bottom reinforcement shall be located a minimum of 3 inches clear from the bottom of the footing. R403.1.3.
- Footing projections, P, shall be at least 2 inches and shall not exceed the thickness of the footing. R403.1.3
- In Seismic zone D<sub>1</sub> where a construction joint is created between a concrete footing and stem wall (concrete or masonry), min of one #4 bar shall be provided not more than 4' on center. The vertical bars shall extend to 3" clear of the bottom of the footing, have a standard hook and extend a minimum of 14" into the stem wall. R403.1.3.
- Slabs-on- graded min #4 bar top and bottom. R403.1.3.2
- In Seismic Design Category D<sub>1</sub> interior footings supporting bearing or bracing walls and cast monolithically with a slab on grade shall extend to a depth of not less than 18 inches below the top of slab.

## FOUNDATIONS



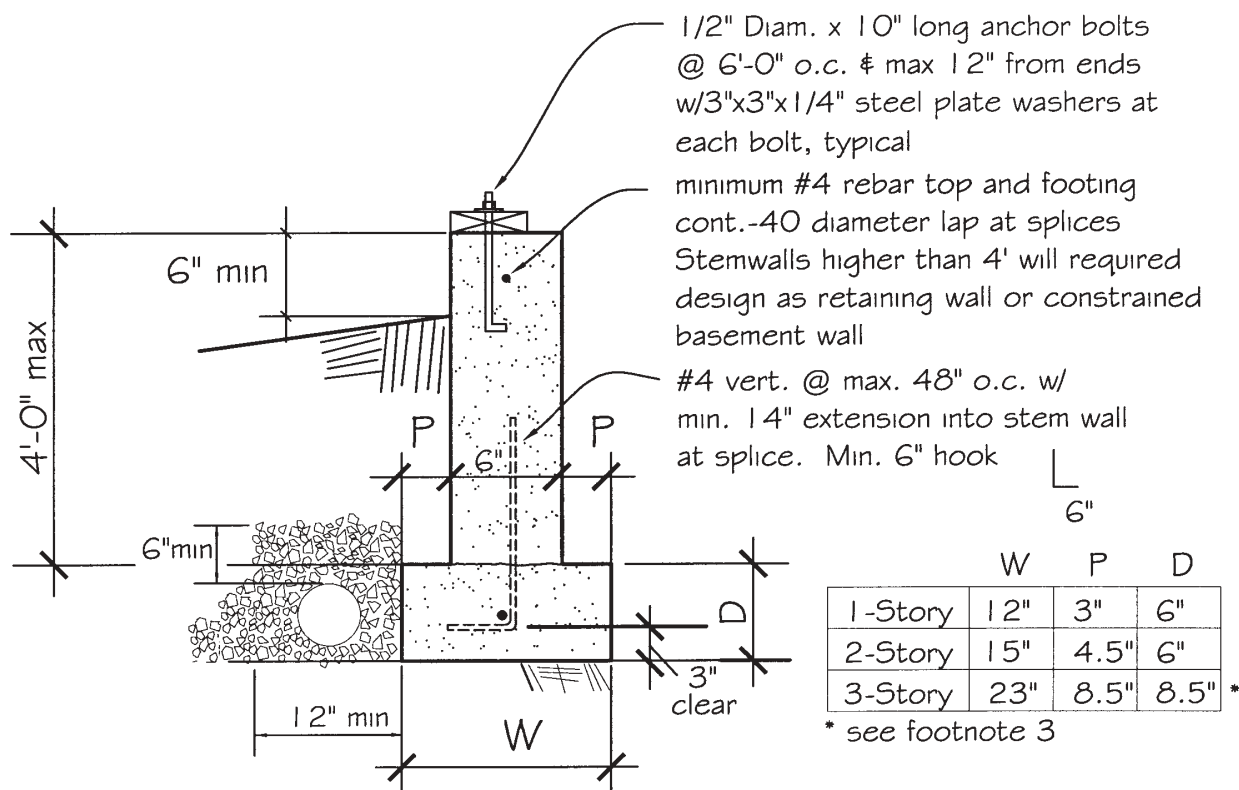
For SI: 1 inch = 25.4 mm.

FIGURE R403.1(1)  
CONCRETE AND MASONRY FOUNDATION DETAILS

# Southwest Washington Chapter of ICC

This construction detail is accepted as meeting the minimum standard of construction as based upon the 2004 IRC / WAC 51-50 requirements and is accepted in the following regional jurisdictions

City of Battle Ground, Clark County, Cowlitz County, Skamania County, City of Camas, City of Centralia, City of Kalama, City of Longview, City of Ridgefield, City of Vancouver, City of Washougal, City of Winlock, City of Woodland



## Note:

1. Grade shall fall a minimum of 6" in the first 10' or footing drain will be required. See IRC 401.3.
2. Drainage to be 3" diam. perforated pipe with 3/4" min. crushed rock or gravel and approved filter membrane. See R405.1.
3. Anchor bolt space for 3-story building shall be 48" o.c.
4. Footing projection P min. 2" and shall not exceed footing depth.
5. Vertical and horizontal wall reinforcements shall be placed no closer to the outside face of the wall than one-half the wall thickness.
6. Maximum 4'-0" high stemwall with no surcharge permitted (IRC 404.1.3). See basement wall detail for higher stemwalls.

TYPICAL FOUNDATION

3-9-04 m/m/jrg

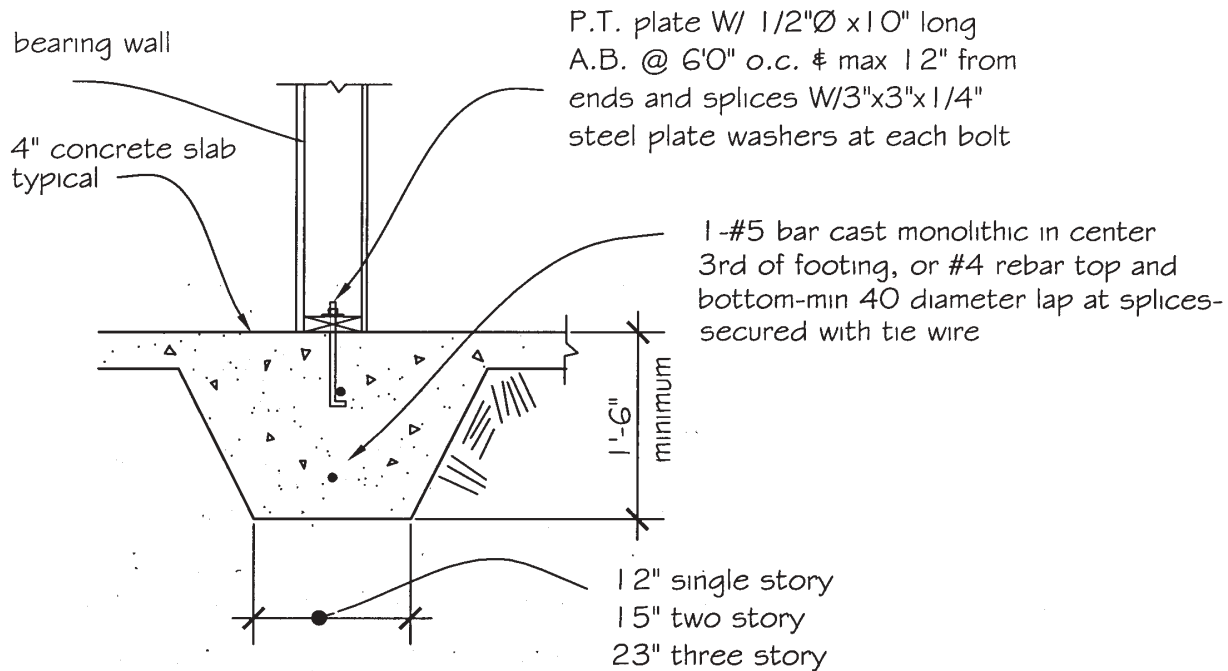
**R403.1**



## Southwest Washington Chapter of ICC

This construction detail is accepted as meeting the minimum standard of construction as based upon the 2004 IRC / WAC 51-50 requirements and is accepted in the following regional jurisdictions

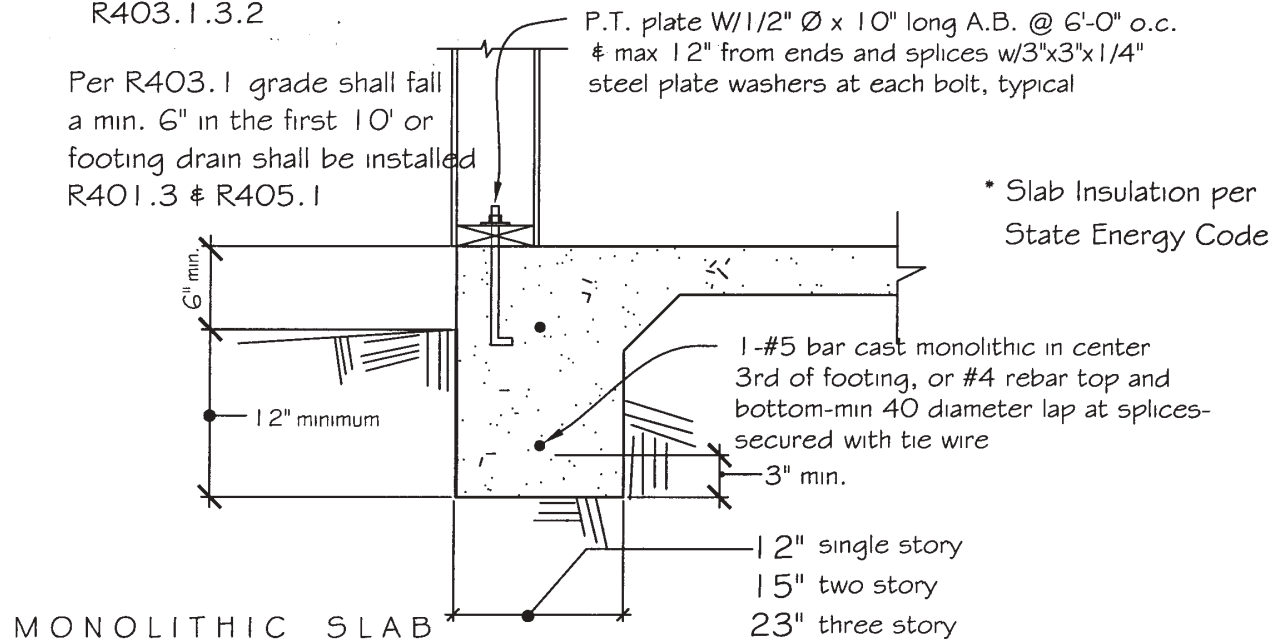
City of Battle Ground, Clark County, Cowlitz County, Skamania County, City of Camas, City of Centralia, City of Kalama, City of Longview, City of Ridgefield, City of Vancouver, City of Washougal, City of Winlock, City of Woodland



### INTERIOR SLAB ON GRADE AT BEARING WALL

R403.1.3.2

Per R403.1 grade shall fall a min. 6" in the first 10' or footing drain shall be installed R401.3 & R405.1



### MONOLITHIC SLAB

R403.1.4.2

### TYPICAL FOUNDATION

3-9-04 mlm

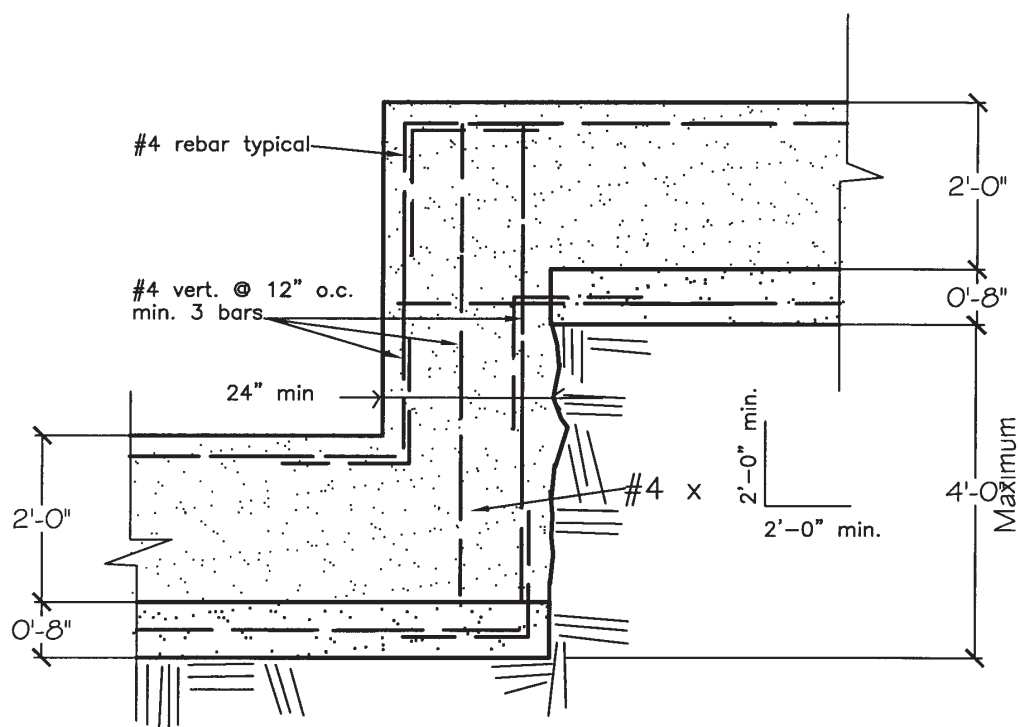
### R403.1.4.2

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## Foundation anchorage in Seismic Design Category D<sub>1</sub>

- Plate washers conforming to Section R602.11.1 shall be used on each bolt.
- Interior braced wall plates shall have anchor bolts spaced at not more than 6 feet (1829mm) on center and located within 12 inches (305 mm) from the ends of each plate section when supported on a continuous foundation.
- Interior bearing wall sole plates shall have anchor bolts spaced at not more than 6 feet (1829 mm) on center and located within 12 inches (305mm) from the ends of each plate section when supported on a continuous foundation.
- The maximum anchor bolt spacing shall be 4 feet (1219mm) for buildings over two stories in height.
- Stepped cripple walls shall conform to Section R602.11.3.
- In seismic zone D<sub>1</sub> braced wall panels shall be supported by continuous footings. All required interior braced wall panels in building with plan dimensions greater than 50' shall be supported by continuous footings. R403.1.2.
- **R403.1.5 Slope.** The top surface of footings shall be level. The bottom surface of footings shall not have a slope exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footings or where the slope of the bottom surface of the footings will exceed one unit vertical in ten units horizontal (10-percent slope).

## CLARK COUNTY BUILDING DIVISION

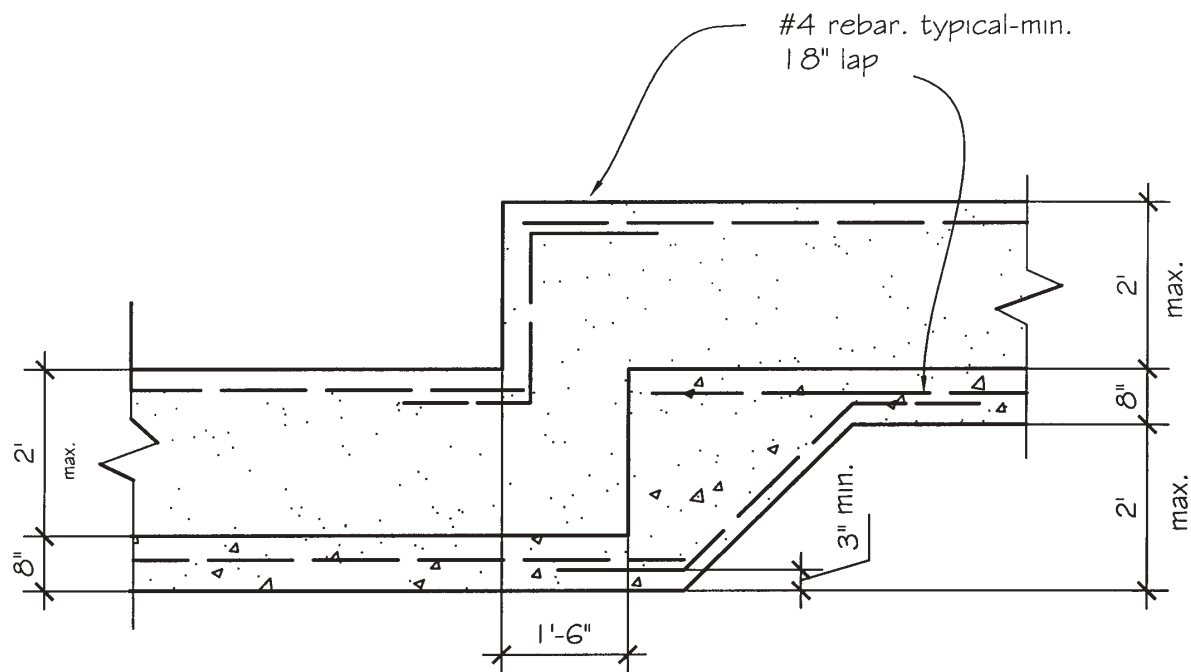


- 1) min. 8" deep x 16" wide footings.
- 2) do not locate another vertical step in footing within a horiz. distance of 8'-0" from step shown.
- 3) footing shall be a min. of 18" below exterior finished grade.

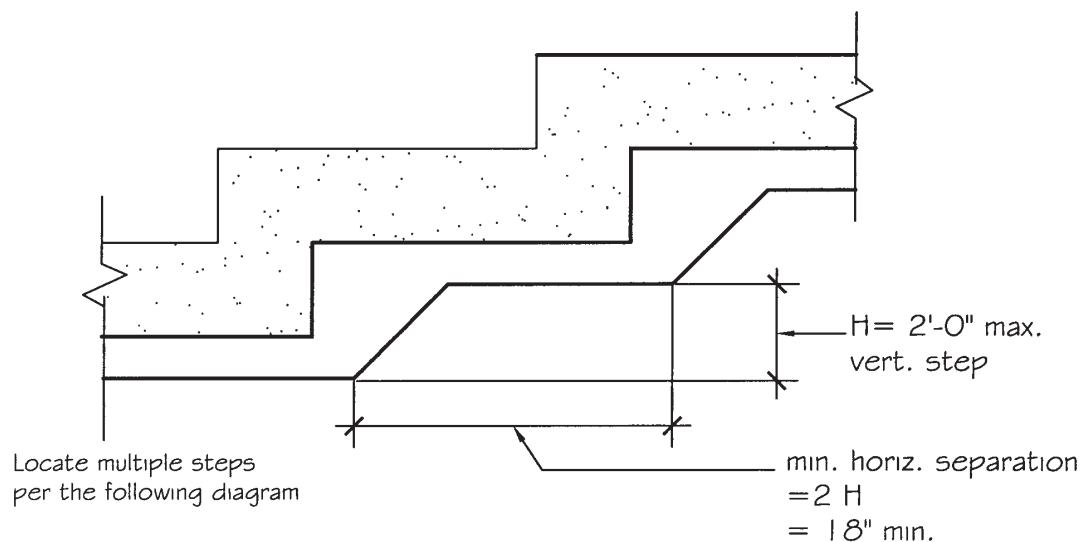
4' STEP FOOTING



# CLARK COUNTY BUILDING DIVISION

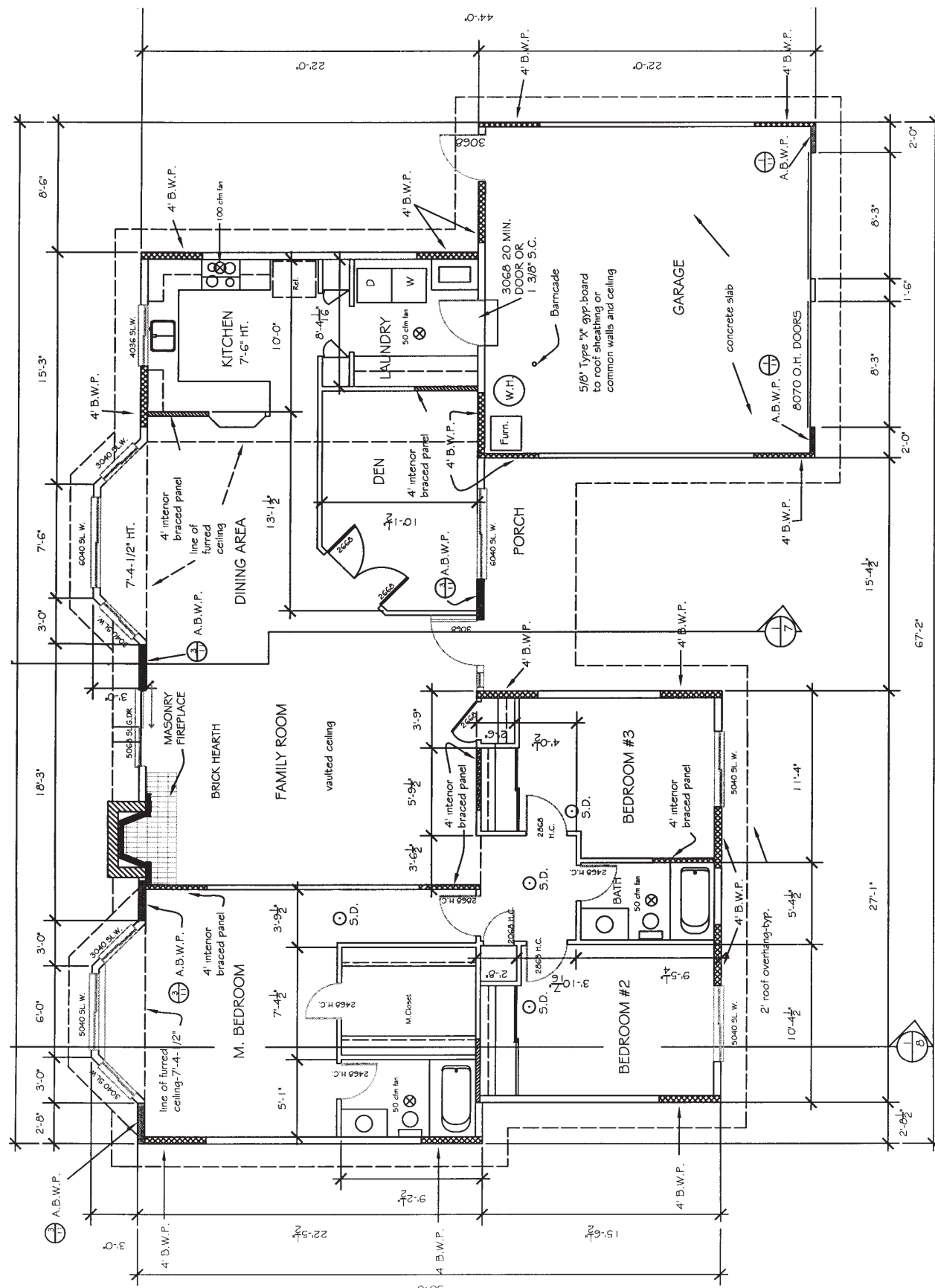


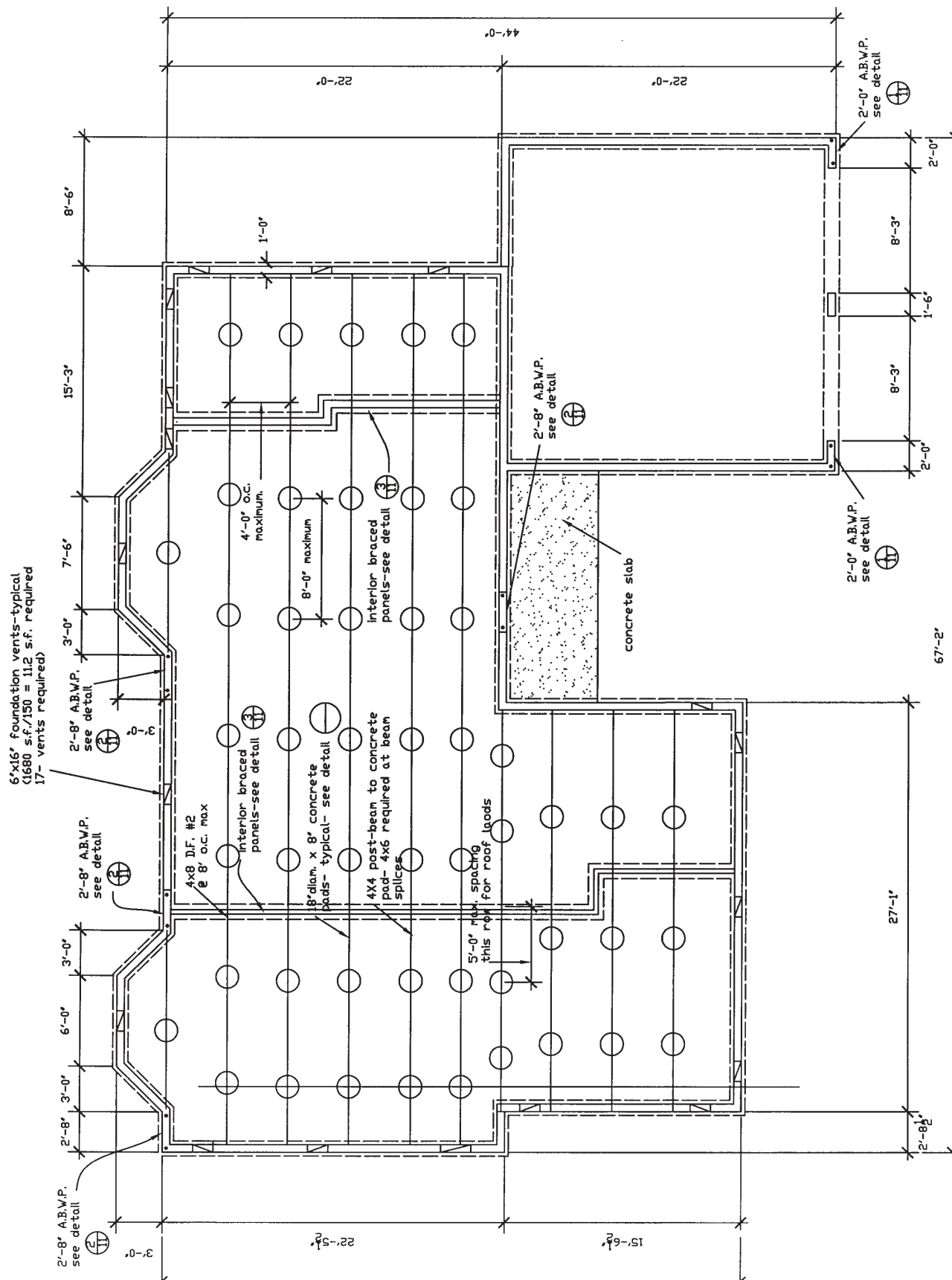
SECTION THRU WALL

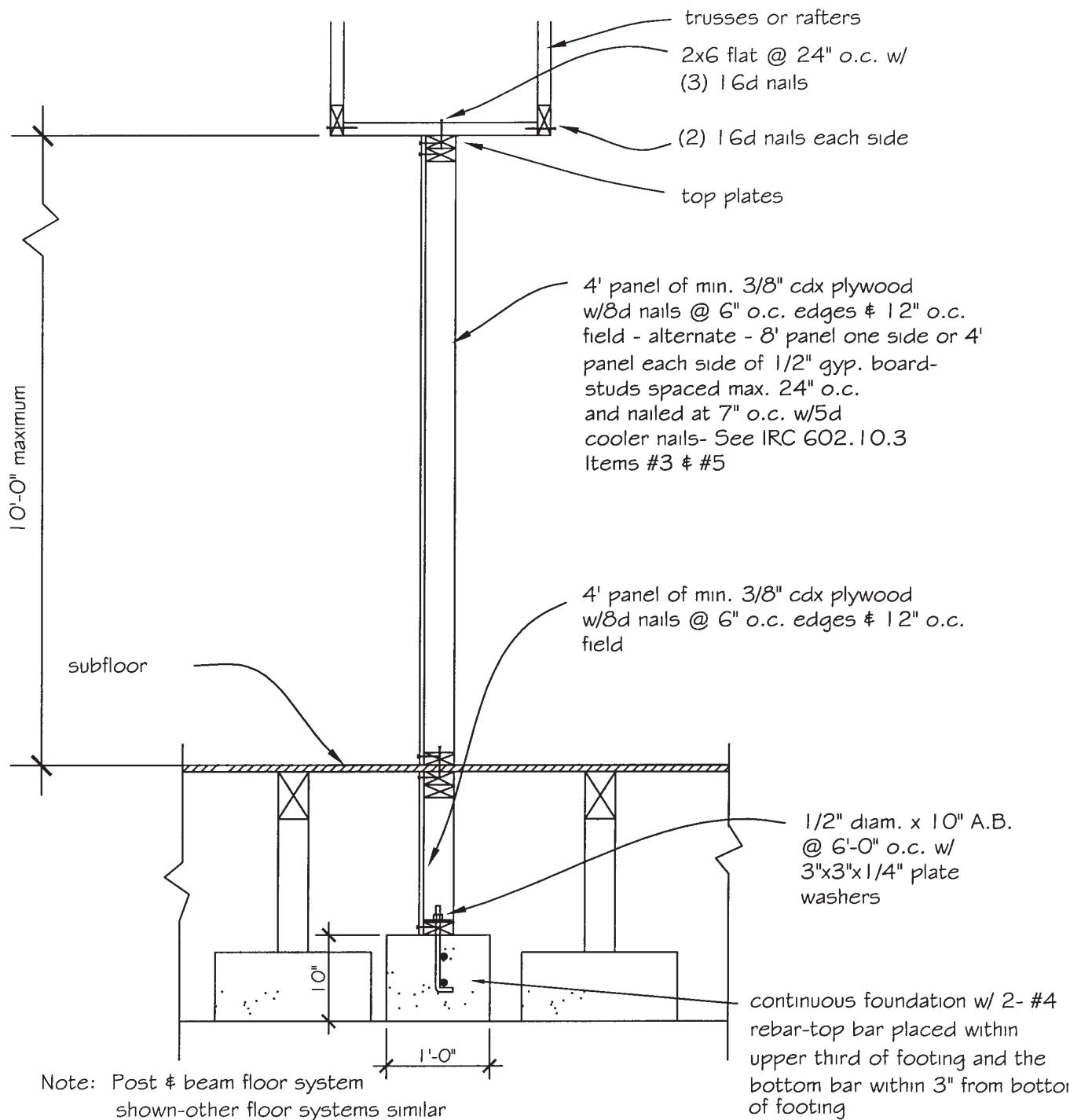


WALL ELEVATION

2' STEP FOOTING







## Interior Braced Wall Panels

R602.10.6-C

## FOUNDATION WALLS R404

- **R404.1.3 Design required.** A design in accordance with accepted engineering practice shall be provided for concrete or masonry foundation walls when any of the following conditions exist:

1. Walls are subject to hydrostatic pressure from ground water.
2. Walls supporting more than 48 inches (1219 mm) of unbalanced backfill that do not have permanent lateral support at the top and bottom.

### R404.1.4

- Foundation walls located in Seismic Design Categories D1 and D2, as established in Table R301.2(1), supporting more than 4 feet (1219 mm) of unbalanced backfill or exceeding 8 feet (2438 mm) in height shall be constructed in accordance with Table R404.1.1(2), R404.1.1(3) or R404.1.1(4) and shall have two No. 4 (No. 13) horizontal bars located in the upper 12 inches (305 mm) of the wall.

**TABLE R404.1.1(2)**  
**REINFORCED CONCRETE AND MASONRY<sup>a</sup> FOUNDATION WALLS**

MAXIMUM WALL HEIGHT (FEET)	MAXIMUM UNBALANCED BACKFILL HEIGHT <sup>e</sup> (FEET)	MINIMUM VERTICAL REINFORCEMENT SIZE AND SPACING <sup>b,c</sup> FOR 8-INCH NOMINAL WALL THICKNESS		
		Soil classes <sup>d</sup>		
		GW, GP, SW and SP soils	GM, GC, SM, SM-SC and ML soils	SC, MH, ML-CL and inorganic CL soils
6	5	#4 at 48" o.c.	#4 at 48" o.c. #4	#4 at 48" o.c.
	6	#4 at 48" o.c.	at 40" o.c.	#5 at 48" o.c.
7	4	#4 at 48" o.c. #4	#4 at 48" o.c. #4	#4 at 48" o.c.
	5	at 48" o.c. #4 at	at 48" o.c. #5 at	#4 at 40" o.c.
	6	48" o.c. #4 at 40"	48" o.c.	#5 at 40" o.c.
	7	o.c.	#5 at 40" o.c.	#6 at 48" o.c.
8	5	#4 at 48" o.c. #4	#4 at 48" o.c.	#4 at 40" o.c.
	6	at 48" o.c. #5 at	#5 at 48" o.c.	#5 at 40" o.c.
	7	48" o.c.	#6 at 48" o.c.	#6 at 40" o.c.
	8	#5 at 40" o.c.	#6 at 40" o.c.	#6 at 24" o.c.
9	5	#4 at 48" o.c.	#4 at 48" o.c.	#5 at 48" o.c.
	6	#4 at 48" o.c. #5	#5 at 48" o.c. #6	#6 at 48" o.c.
	7	at 48" o.c. #5 at	at 48" o.c. #6 at	#6 at 32" o.c.
	8	40" o.c.	32" o.c.	#6 at 24" o.c.
	9	#6 at 40" o.c.	#6 at 24" o.c.	#6 at 16" o.c.

<sup>a</sup> Mortar shall be Type M or SS and masonry shall be laid in running bond.

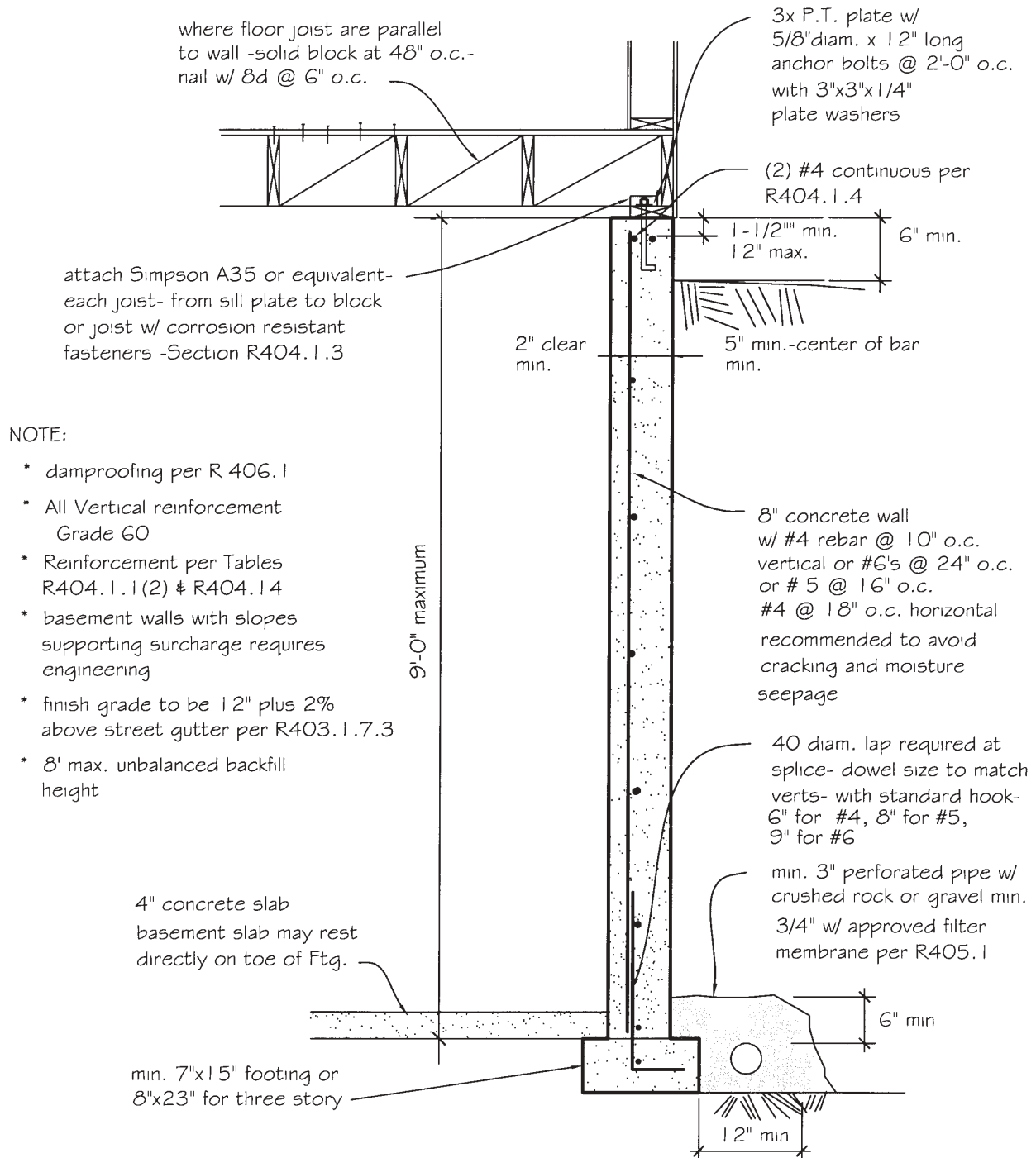
<sup>a</sup> Alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per lineal foot of wall shall be permitted provided the spacing of the reinforcement does not exceed 72 inches.

<sup>a</sup> Vertical reinforcement shall be Grade 60 minimum. The distance from the face of the soil side of the wall to the center of vertical reinforcement shall be at least 5 inches.

<sup>a</sup> Soil classes are in accordance with the Unified Soil Classification System. Refer to Table R405.1.

<sup>e</sup> Unbalanced backfill height is the difference in height of the exterior and interior finish ground levels. Where an interior concrete slab is provided, the unbalanced backfill height shall be measured from the exterior finish ground level to the top of the interior concrete slab.

## Southwest Washington Chapter of ICC

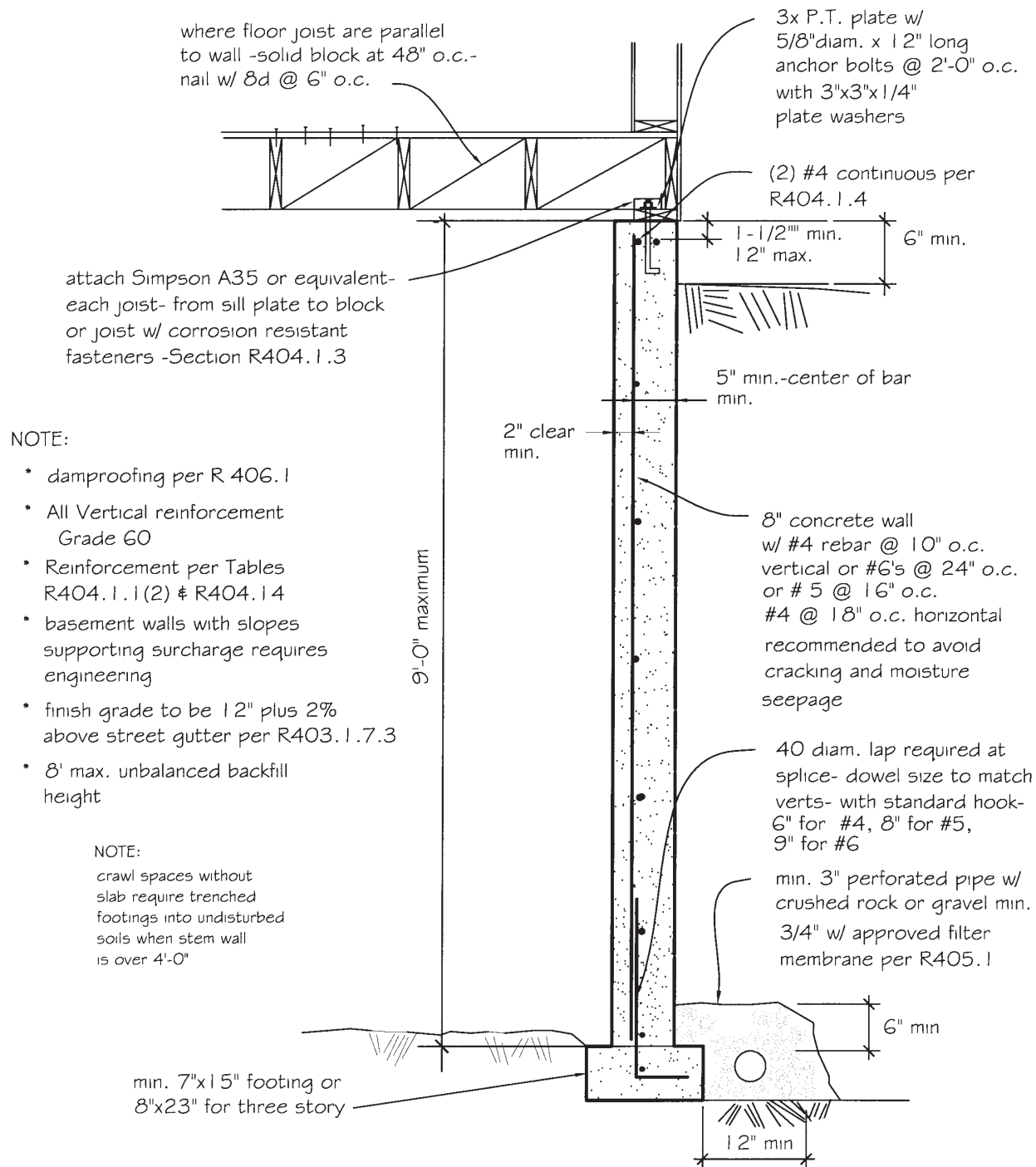


RESIDENTIAL BASEMENT WALL- 4' TO 8' HIGH

4-19-04  
MLM/JRG

R404.1.1(2)

# Southwest Washington Chapter of ICC



RESIDENTIAL FOUNDATION WALL- 4' TO 8' HIGH

5-6-04  
MLM/JRG

R404.1.1(2)

## Section Three: Decks, framing, and beams

Presented by Lou Malattia and Pat Lawler

### Decks

**Posts, poles and columns.** Posts, poles and columns supporting permanent structures that are embedded in concrete in direct contact with the ground or embedded in concrete exposed to the weather shall be approved pressure preservative treated wood suitable for ground contact use. R319.1.3

**Geographical areas.** In geographical areas where experience has demonstrated a specific need, approved naturally durable or pressure preservative treated wood shall be used for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances when such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering that would prevent moisture or water accumulation on the surface or at joints between members. Depending on local experience, such members may include:

1. Horizontal members such as girders, joists and decking.
2. Vertical members such as posts, poles and columns.
3. Both horizontal and vertical members. R319.1.2

**Fasteners.** Fasteners for pressure preservative and fire-retardant-treated wood shall be of hot-dipped galvanized steel, stainless steel, silicon bronze or copper. R319.3

TABLE R301.5  
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS  
(in pounds per square foot)

USE	LIVE LOAD
Attics with storage <sup>b</sup>	20
Attics without storage <sup>b</sup>	10
Decks <sup>c</sup>	40
Exterior balconies	60
Fire escapes	40
Guardrails and handrails <sup>d</sup>	200
Guardrails in-fill components <sup>f</sup>	200
Passenger vehicles garages <sup>a</sup>	50 <sup>a</sup>
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40 <sup>c</sup>

For SI: 1 pound per square foot = 0.0479 kN/m<sup>2</sup>. 1 square inch = 645 mm<sup>2</sup>. 1



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**Guards required**

Porches, balconies or raised floor surfaces located more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 36 inches (914mm) in height. Open sides of stairs with a total rise of more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 34 inches (864 mm) in height measured vertically from the nosing of the treads. Porches and decks which are enclosed with insect screening shall be provided with guards where the walking surface is located more than 30 inches (762 mm) above the floor or grade below. R312.1

**Decks attachments**

Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. For decks with cantilevered framing members, connections to exterior walls or other framing members, shall be designed and constructed to resist uplift resulting from the full live load specified in Table R301.4 acting on the cantilevered portion of the deck. R502.2.1

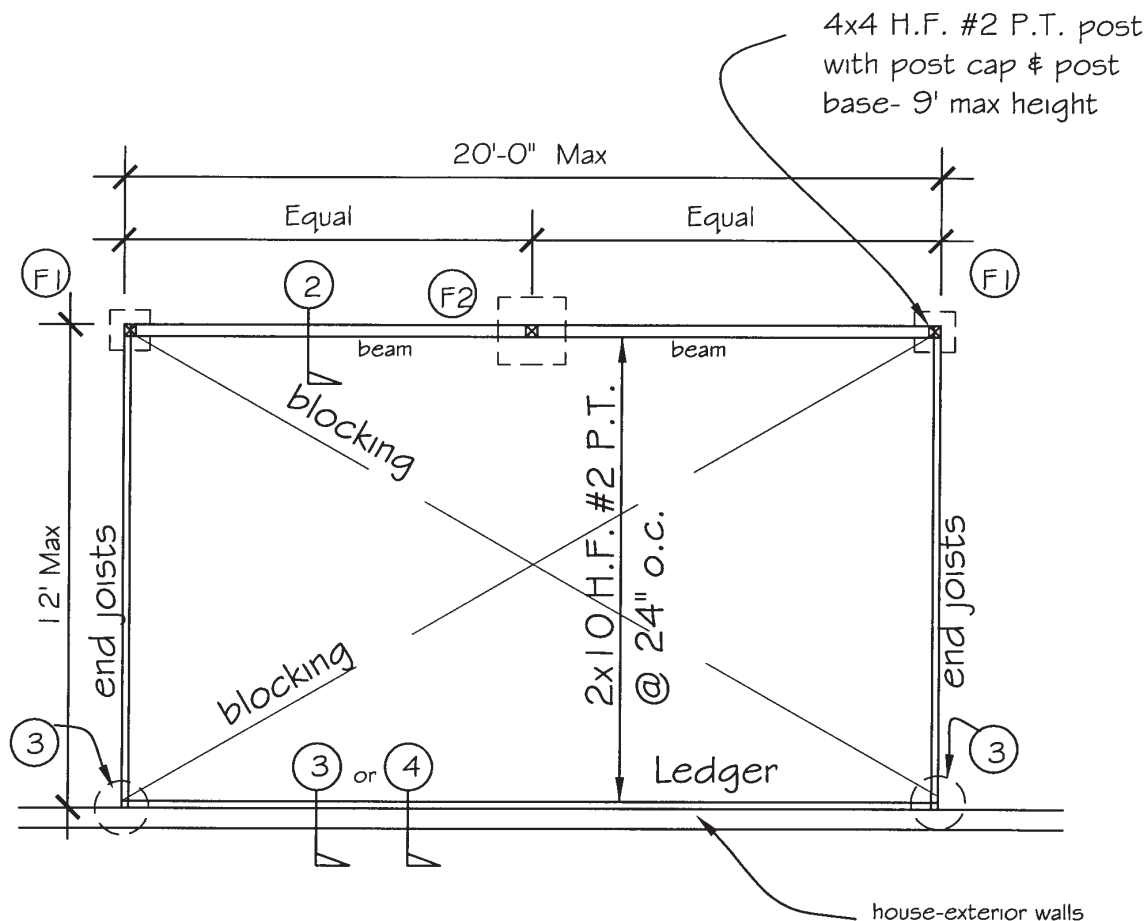
**Flashing**

Approved corrosion-resistive flashing shall be provided in the exterior wall envelope in such a manner as to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. The flashing shall extend to the surface of the exterior wall finish and shall be installed to prevent water from reentering the exterior wall envelope. Approved corrosion-resistant flashings shall be installed at all of the following locations:

1. At top of all exterior window and door openings in such a manner as to be leak proof, except that self-flashing windows having a continuous lap of not less than 1 1/8 inches (28 mm) over the sheathing material around the perimeter of the opening, including corners, do not require additional flashing; jamb flashing may also be omitted when specifically approved by the building official.
2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
3. Under and at the ends of masonry, wood or metal copings and sills.
4. Continuously above all projecting wood trim.
5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
6. At wall and roof intersections.
7. At built-in gutters.

# Residential Building Code Training

NOTE: All exposed lumber to be pressure treated (P.T.) or decay resistant. Fasteners for P.T. wood shall be hot-dipped galv. or stainless steel



Beam= 4x10 H.F. #2 P.T. for 8' max span

4x12 H.F. #2 P.T. for 10' max span

Blocking- Tight fit solid 2x blocking with Simpson CS-16 strap with 8d nails

F1- 12" x 12" x 8" minimum concrete footing

F2- 18" x 18" x 12" minimum concrete footing  
w/ (2) #4 each way



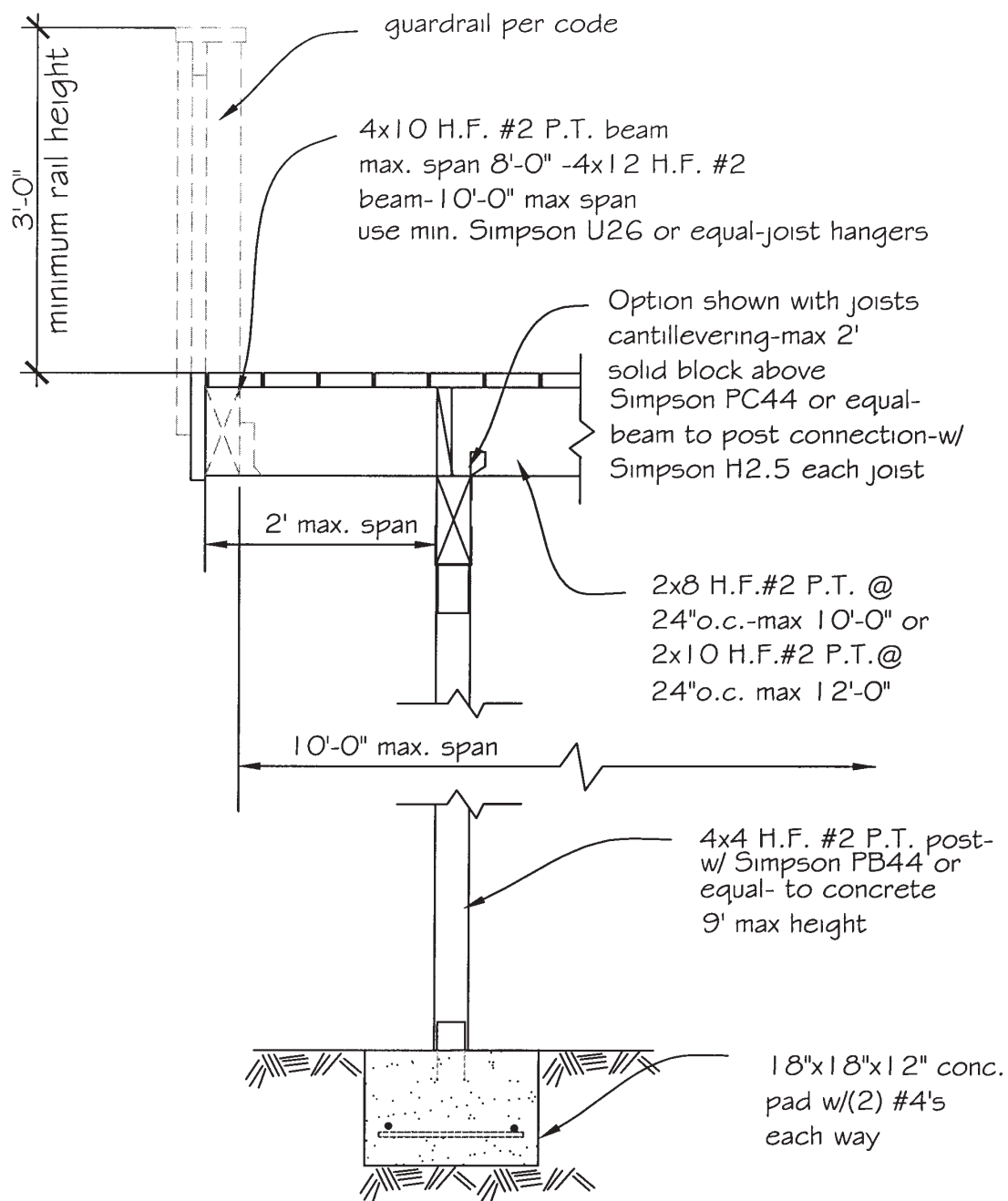
FLOOR PLAN - 12'x 20' Deck(max)

scale- 1/4" = 1'-0"

RESIDENTIAL DECKS

ICC 6-1-04

MSC-19



2

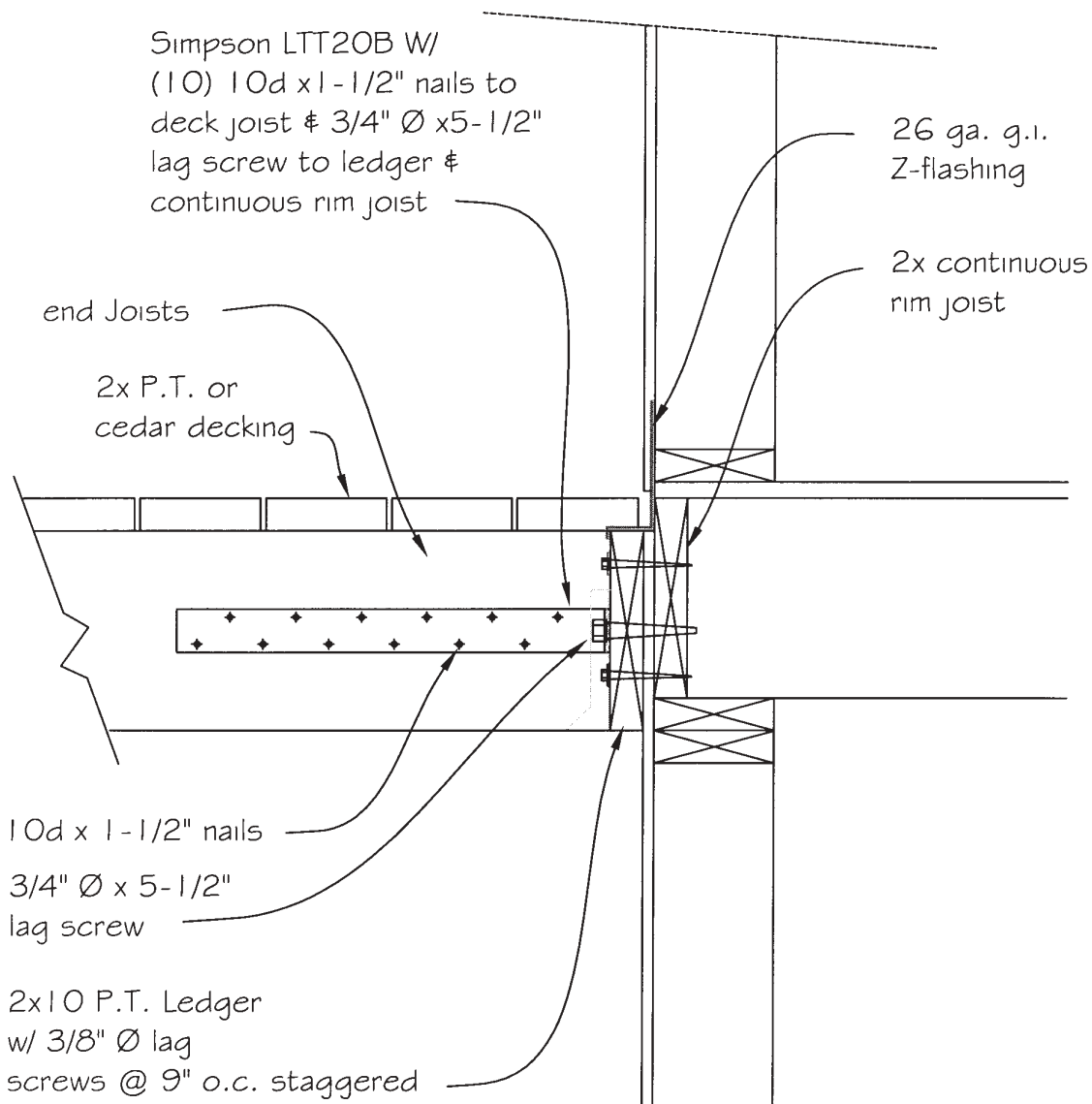
SECTION

scale- 3/4" = 1'-0"

RESIDENTIAL DECKS

ICC 6-104

MSC-20



NOTE: Install LTT29B prior to installation  
of 2x tight fit diagonal solid blocking-see plan

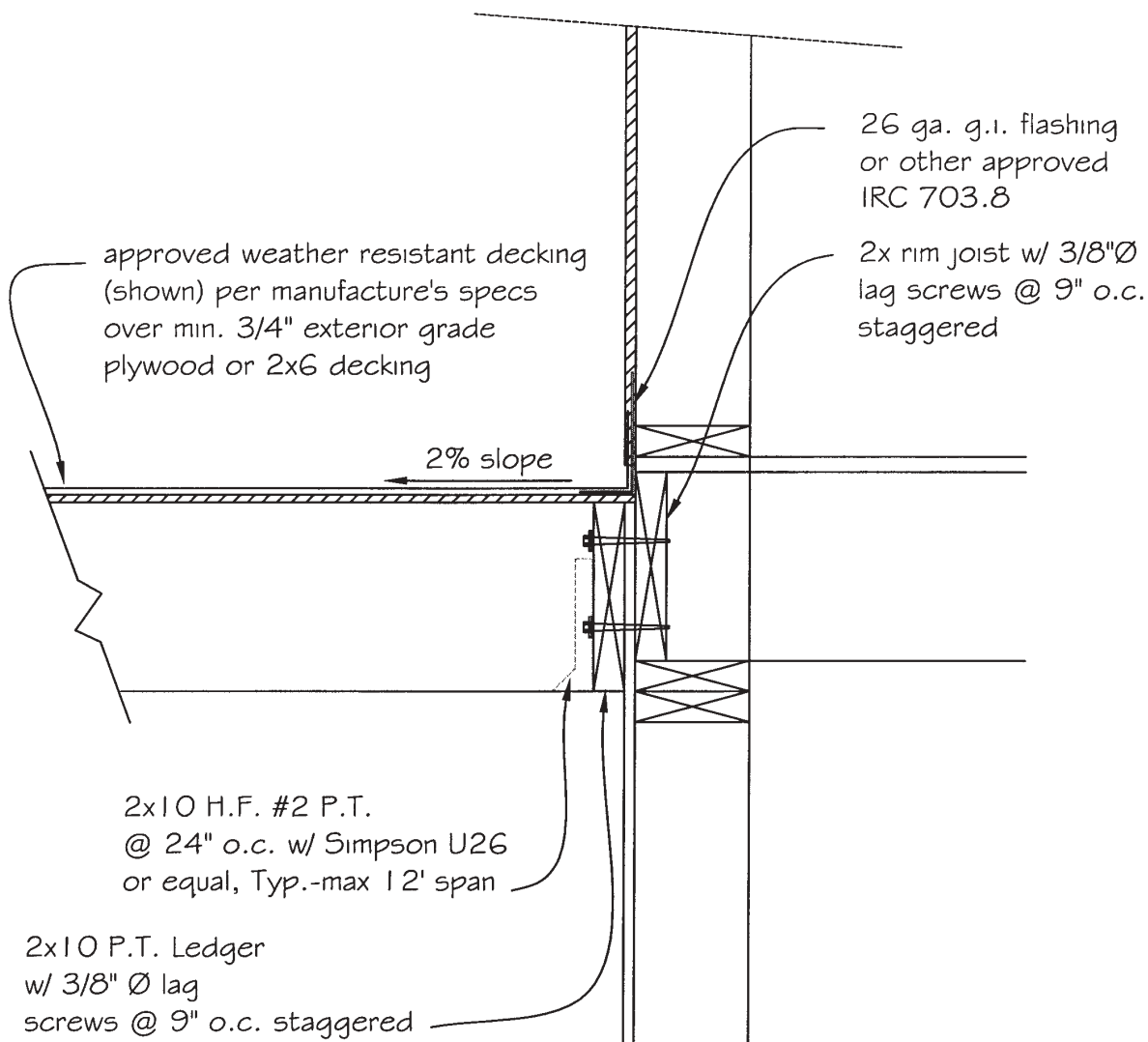
### 3 TYPICAL END CONNECTION

scale- 1" = 1'-0"

RESIDENTIAL DECKS

ICC 6-104

MSC-21



NOTE: \*Provide minimum slope or other approved means to prevent ponding or water damage to residence.

\*If using "I-joists" Type floor framing, solid 1-1/2" wide min.

4

## TYPICAL END CONNECTION

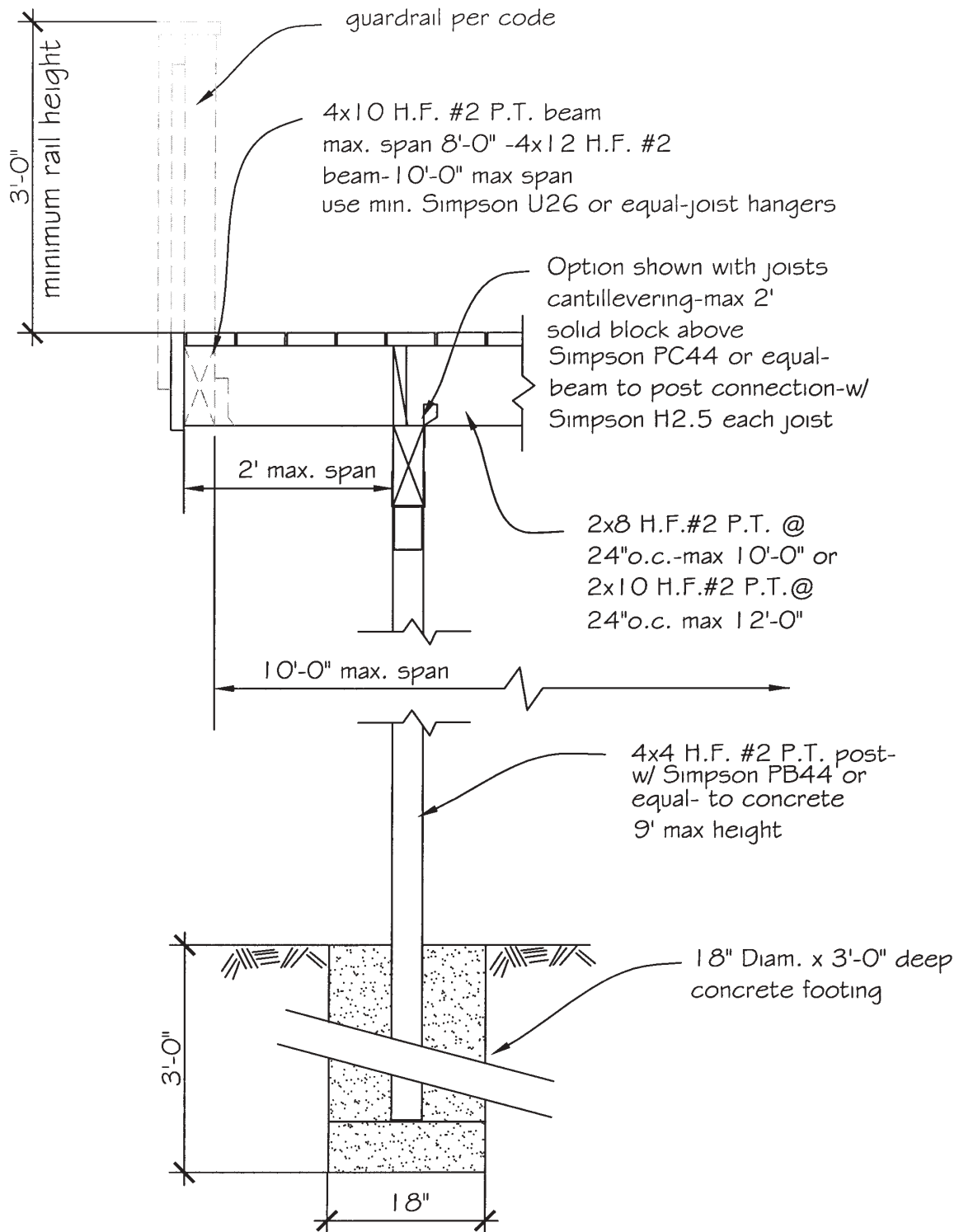
scale- 1-1/2" = 1'-0"

RESIDENTIAL DECKS

ICC- 6-1-04

MSC-22

# Residential Building Code Training



**2** SECTION  
scale- 3/4" = 1'-0"

RESIDENTIAL DECKS

ICC 6-04

MSC-23

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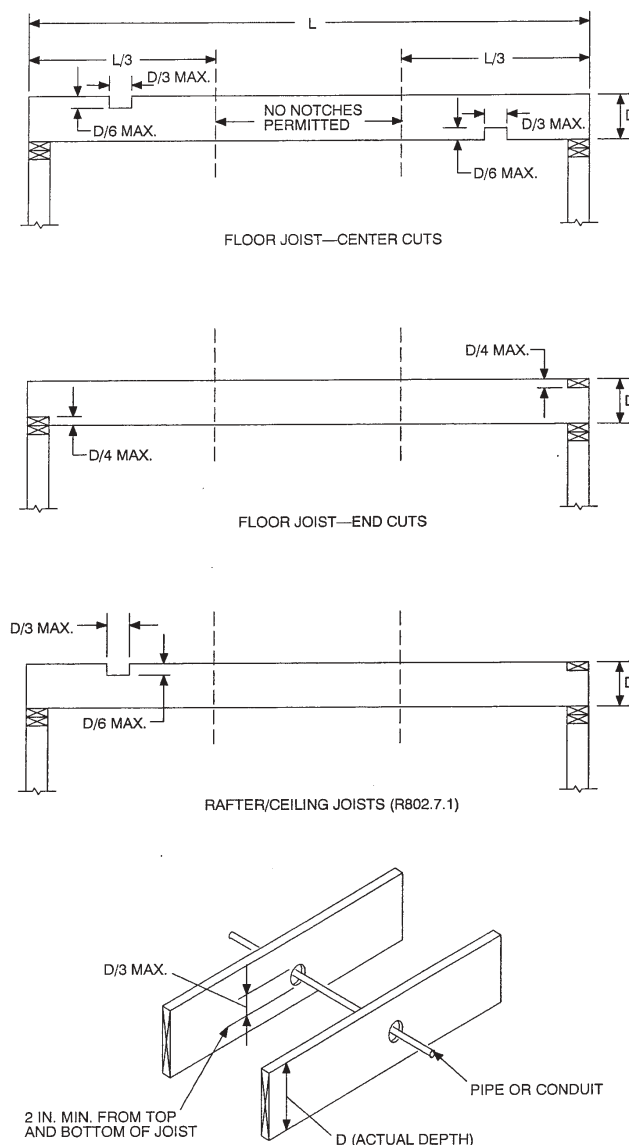
## Framing

**Framing tables** are as follows:

- Floor joists spans ( Table R502.3.1 (2) ) with live loads of 40 psf
- Cantilever spans – light frame exterior bearing walls and roof ( Table R502.3.3 (1) ) with floor live loads of 40 psf and roof live loads of <20
- Cantilever spans for exterior balconies ( Table R502.3.3 (2) )
- Stud height limits ( Table R602.3 (5) ) – bearing or nonbearing
- Maximum allowable stud lengths ( Table R602.3.1 ) footnotes controls these lengths – very specific
- Rafter spans ( Table R802.5.1 (3) ) with live load of 30psf and no ceiling attached to rafter
- Rafter spans ( Table R802.5.1 (5) ) with live load of 30 psf and ceiling attached to rafter (vaults)

## Notching and Drilling Joists

- Permitted to notch end thirds to a maximum depth of one sixth the joist depth and to a width of one third the joist depth. **No notching in middle third.**
- Cutting joist ends permitted to a depth of one fourth joist depth.
- Permitted to notch rafter/ceiling joists a maximum depth of one sixth the joist depth and to a width of one third the joist depth.
- Boring joist permitted to a maximum of one third the joist depth and leaving a minimum of two inches from edge.

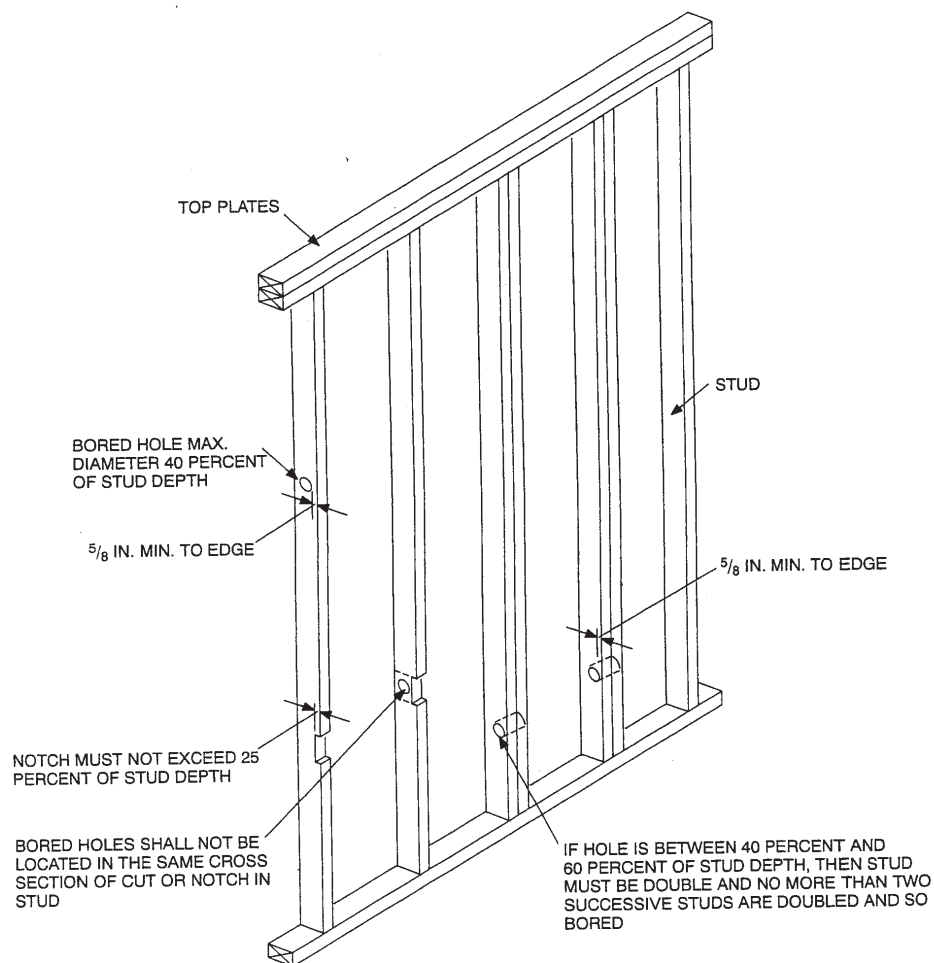


For SI: 1 inch = 25.4 mm.

FIGURE R502.8  
CUTTING, NOTCHING AND DRILLING



## Bearing Walls



For SI: 1 inch = 25.4 mm.

Note: Condition for exterior and bearing walls.

**FIGURE R602.6(1)**  
**NOTCHING AND BORED HOLE LIMITATIONS FOR EXTERIOR WALLS AND BEARING WALLS**

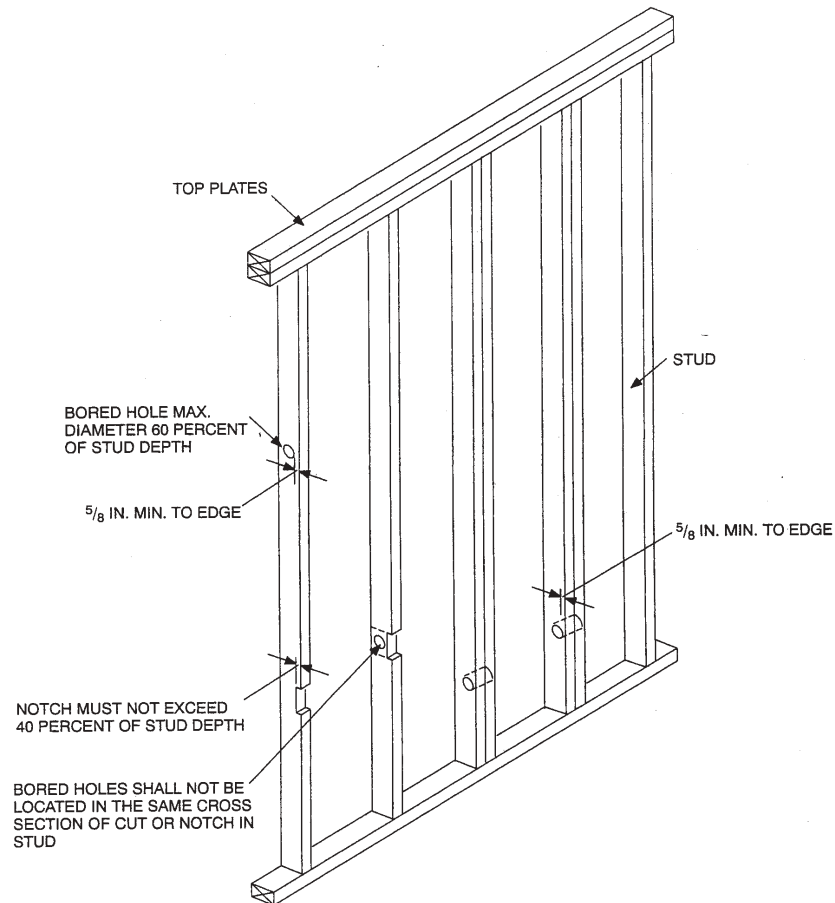
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## Non-bearing Walls

- Notching not to exceed 25% of stud depth
- Boring of stud not to exceed 40% of stud depth with 5/8 inch from edges
- Boring of 40% to 60% of the stud depth, stud **shall be doubled and not more than two successive studs shall be bored.**
- Borings shall not be in same cross section as notches.

### WALL CONSTRUCTION



For SI: 1 inch = 25.4 mm.

FIGURE R602.6(2)  
NOTCHING AND BORED HOLE LIMITATIONS FOR INTERIOR NONBEARING WALLS

## Top Plates

- Notches greater than 50% of plate width shall be strapped with a 1 ½ inch strap and have (8) 16d's each side of notch.

### WALL CONSTRUCTION

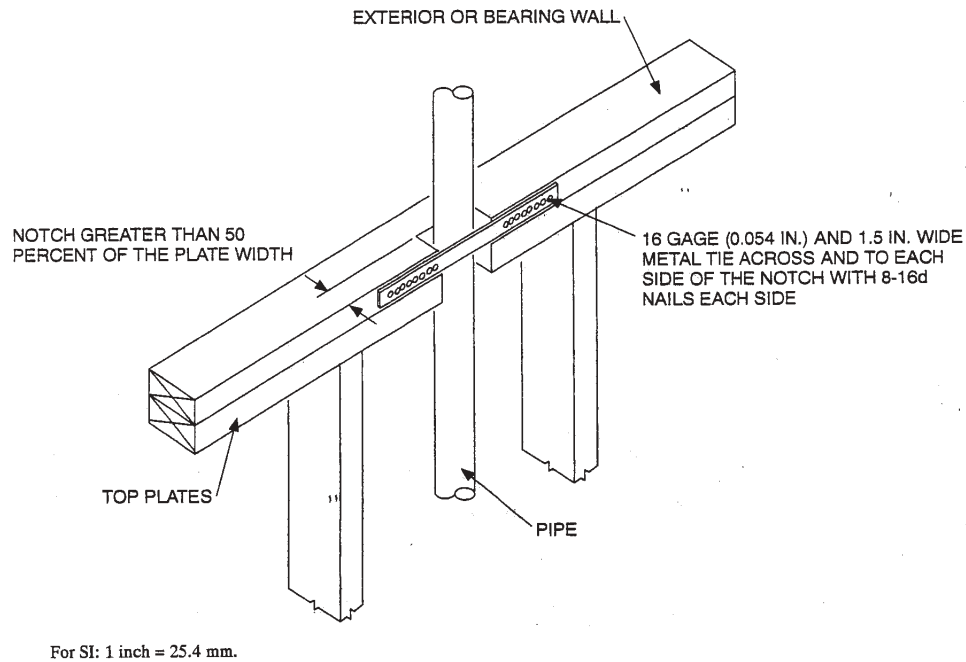


FIGURE R602.6.1  
TOP PLATE FRAMING TO ACCOMMODATE PIPING

## Blocking

- In Seismic Zone D<sub>1</sub> ( Clark County ) lateral restraints shall be provided at each intermediate support.

## Fasteners

Fasteners for pressure preservative and fire-retardant-treated wood shall be of hot -dipped galvanized steel, stainless steel, silicon bronze or copper.

Standard number of framing fasteners shall be per Table R602.3(1).

Changes consist of:

- Stud to sole 3-8d's instead of 4-8d's
- Double stud face nail 10d's @ 24"o.c. instead of 16d's @ 24"o.c.
- Double plate face nail 10d's @ 24"o.c. instead of 16d's @ 24"o.c.
- Top plate laps at corners or intersections 2-10d's instead of 2-16d's
- Ceiling joists, lap over partitions, face nail 3-10d's instead of 3-16d's
- Ceiling joists to parallel rafter, face nail 3-10d's instead of 3-16d's
- Rafter to plate, toe nail 2-16d's instead of 3-8d's
- Built up corner studs 10d's @ 24"o.c. instead of 16d's @24"o.c.
- Built up girders and beams 10d's 32"o.c. staggered and two nails at ends and at splices instead of 20d's

New to chart is the following;

Roof rafters to ridge, valley, or hip rafter

- toe nail 4-16d's
- face nail 3-16d's
- rafter ties to rafter, face nail 3-8d's

### Truss to wall connection

Trusses shall be connected to wall plates by the use of approved connectors having a resistance to uplift of not less than 175 pounds (79.45kg.) and shall be installed in accordance with the manufacturer's specifications.

### Uplift resistance

Roof assemblies which are subject to wind uplift pressures of 20 pounds per square foot (0.958 kN/m<sup>2</sup>) or greater shall have roof rafters or trusses attached to their supporting wall assemblies.

A continuous load path shall be provided to transmit the uplift forces from the rafter or truss ties to the foundation.

## WALL CONSTRUCTION

TABLE R602.3(1)  
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER <sup>a,b,c,d</sup>	SPACING OF FASTENERS
Joist to sill or girder, toe nail	3-8d	—
1" x 6" subfloor or less to each joist, face nail	2-8d 2 staples, 1 <sup>3</sup> / <sub>4</sub> "	—
2" subfloor to joist or girder, blind and face nail	2-16d	—
Sole plate to joist or blocking, face nail	16d	16" o.c.
Top or sole plate to stud, end nail	2-16d	—
Stud to sole plate, toe nail	→ 3-8d or 2-16d	—
Double studs, face nail	→ 10d	24" o.c.
Double top plates, face nail	→ 10d	24" o.c.
Sole plate to joist or blocking at braced wall panels	3-16d	16" o.c.
Double top plates, minimum 24-inch offset of end joints, face nail in lapped area	→ 8-16d	—
Blocking between joists or rafters to top plate, toe nail	3-8d	—
Rim joist to top plate, toe nail	8d	6" o.c.
Top plates, laps at corners and intersections, face nail	→ 2-10d	—
Built-up header, two pieces with 1/2" spacer	16d	16" o.c. along each edge
Continued header, two pieces	16d	16" o.c. along each edge
Ceiling joists to plate, toe nail	3-8d	—
Continuous header to stud, toe nail	4-8d	—
Ceiling joist, laps over partitions, face nail	→ 3-10d	—
Ceiling joist to parallel rafters, face nail	→ 3-10d	—
Rafter to plate, toe nail	→ 2-16d	—
1" brace to each stud and plate, face nail	2-8d 2 staples, 1 <sup>3</sup> / <sub>4</sub> "	—
1" x 6" sheathing to each bearing, face nail	2-8d 2 staples, 1 <sup>3</sup> / <sub>4</sub> "	—
1" x 8" sheathing to each bearing, face nail	2-8d 3 staples, 1 <sup>3</sup> / <sub>4</sub> "	—
Wider than 1" x 8" sheathing to each bearing, face nail	3-8d 4 staples, 1 <sup>3</sup> / <sub>4</sub> "	—
Built-up corner studs	→ 10d	24" o.c.
Built-up girders and beams, 2-inch lumber layers	→ 10d	Nail each layer as follows: 32" o.c. at top and bottom and staggered. Two nails at ends and at each splice.
2" planks	2-16d	At each bearing
Roof rafters to ridge, valley or hip rafters: toe nail	4-16d	—
face nail	→ 3-16d	—
Rafter ties to rafters, face	3-8d	—
Wood structural panels, subfloor, roof and wall sheathing to framing, and particleboard wall sheathing to framing		



# TECHNICAL TOPICS

Form No. TT-012

Page 1 of 1

## EFFECT OF OVERDRIVEN FASTENERS ON SHEAR CAPACITY

The following is a suggested guideline for determining if overdriven fasteners will affect the shear capacity of diaphragm or shear wall construction.

1. If any case described below is met then no reduction in shear capacity needs to be taken.
  - a) If all nails are overdriven into panels by up to 1/16" during construction under dry conditions (moisture content less than 16%).
  - b) If no more than 20% of the fasteners around the perimeter of panels are overdriven by over 1/16" up to 1/8", no reduction in shear capacity needs to be taken.
  - c) If all fasteners around the perimeter of panels appear to be overdriven by the same amount, and it appears that panels have been wetted during construction, it can be assumed that the fastener embedment is due to panel thickness swelling. This can be verified by measuring the thickness of panels where fasteners appear to be overdriven, and comparing to measurements where panels have been protected from the weather, or to the original nominal panel thickness which is part of the APA trademark.
  - d) If actual panels used in construction are thicker than required minimum nominal panel thickness upon which the design shear capacity is based, and the overdriving is less than or equal to the difference between the two panel thicknesses. For example, if design shear for the construction requires a 15/32" minimum nominal panel thickness and the actual sheathing is 19/32" with all fasteners overdriven 1/8", the net result is a 15/32" panel which meets the design shear requirements.
2. If more than 20% of the fasteners around the perimeter of panels are overdriven by over 1/16", or if any are overdriven by more than 1/8", additional fasteners shall be driven to maintain the required shear capacity. For every two fasteners overdriven, one additional fastener shall be driven. If nails were used in the original installation, and are spaced too close to allow the placement of additional nails, then approved staples must be used for the additional fasteners required.

Ref: Andreason, K.R. and J.R. Tissell. 1994. Effects of Overdriven Nails in Shear Walls. APA Report No. T94-9.

Bao, Zhaozhen. 2002. Lateral Shear Resistance of Plywood and OSB With Overdriven Nails. APA Report T2002-7.

Because APA has no control over quality of workmanship or the conditions under which engineered wood products are used, it cannot accept responsibility of product performance or designs as actually constructed. Consult your local jurisdiction or design professional to assure compliance with code, construction, and performance requirements.

Technical Services Division  
October 2002

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## FLOORS

**TABLE R502.3.1(2)**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES (Residential living areas, live load=40 psf, L/Δ=360)**

			DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2x6	2x8	2x10	2x12	2x6	2x8	2x10	2x12
			Maximum floor joist spans							
JOIST SPACING (inches)	SPECIE AND GRADE		(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)	(ft.- in.)
12	Douglas fir-larch	SS	11- 4	15- 0	19- 1	23- 3	11- 4	15- 0	19- 1	23- 3
	Douglas fir-larch	#1	10-11	14- 5	18- 5	22- 0	10-11	14- 2	17- 4	20- 1
	Douglas fir-larch	#2	10- 9	14- 2	17- 9	20- 7	10- 6	13- 3	16- 3	18-10
	Douglas fir-larch	#3	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3	14- 3
	Hem-fir	SS	10- 9	14- 2	18- 0	21-11	10- 9	14- 2	18- 0	21-11
	Hem-fir	#1	10- 6	13-10	17- 8	21- 6	10- 6	13-10	16-11	19- 7
	Hem-fir	#2	10- 0	13- 2	16-10	20- 4	10- 0	13- 1	16- 0	18- 6
	Hem-fir	#3	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3	14- 3
	Southern pine	SS	11- 2	14- 8	18- 9	22-10	11- 2	14- 8	18- 9	22-10
	Southern pine	#1	10-11	14- 5	18- 5	22- 5	10-11	14- 5	18- 5	22- 5
	Southern pine	#2	10- 9	14- 2	18- 0	21- 9	10- 9	14- 2	16-11	19-10
	Southern pine	#3	9- 4	11-11	14- 0	16- 8	8- 6	10-10	12-10	15- 3
	Spruce-pine-fir	SS	10- 6	13-10	17- 8	21- 6	10- 6	13-10	17- 8	21- 6
	Spruce-pine-fir	#1	10- 3	13- 6	17- 3	20- 7	10- 3	13- 3	16- 3	18-10
	Spruce-pine-fir	#2	10- 3	13- 6	17- 3	20- 7	10- 3	13- 3	16- 3	18-10
	Spruce-pine-fir	#3	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3	14- 3
16	Douglas fir-larch	SS	10- 4	13- 7	17- 4	21- 1	10- 4	13- 7	17- 4	21- 0
	Douglas fir-larch	#1	9-11	13- 1	16- 5	19- 1	9- 8	12- 4	15- 0	17- 5
	Douglas fir-larch	#2	9- 9	12- 7	15- 5	17-10	9- 1	11- 6	14- 1	16- 3
	Douglas fir-larch	#3	7- 6	9- 6	11- 8	13- 6	6-10	8- 8	10- 7	12- 4
	Hem-fir	SS	9- 9	12-10	16- 5	19-11	9- 9	12-10	16- 5	19-11
	Hem-fir	#1	9- 6	12- 7	16- 0	18- 7	9- 6	12- 0	14- 8	17- 0
	Hem-fir	#2	9- 1	12- 0	15- 2	17- 7	8-11	11- 4	13-10	16- 1
	Hem-fir	#3	7- 6	9- 6	11- 8	13- 6	6-10	8- 8	10- 7	12- 4
	Southern pine	SS	10- 2	13- 4	17- 0	20- 9	10- 2	13- 4	17- 0	20- 9
	Southern pine	#1	9-11	13- 1	16- 9	20- 4	9-11	13- 1	16- 4	19- 6
	Southern pine	#2	9- 9	12-10	16- 1	18-10	9- 6	12- 4	14- 8	17- 2
	Southern pine	#3	8- 1	10- 3	12- 2	14- 6	7- 4	9- 5	11- 1	13- 2
	Spruce-pine-fir	SS	9- 6	12- 7	16- 0	19- 6	9- 6	12- 7	16- 0	19- 6
	Spruce-pine-fir	#1	9- 4	12- 3	15- 5	17-10	9- 1	11- 6	14- 1	16- 3
	Spruce-pine-fir	#2	9- 4	12- 3	15- 5	17-10	9- 1	11- 6	14- 1	16- 3
	Spruce-pine-fir	#3	7- 6	9- 6	11- 8	13- 6	6-10	8- 8	10- 7	12- 4
19.2	Douglas fir-larch	SS	9- 8	12-10	16- 4	19-10	9- 8	12-10	16- 4	19- 2
	Douglas fir-larch	#1	9- 4	12- 4	15- 0	17- 5	8-10	11- 3	13- 8	15-11
	Douglas fir-larch	#2	9- 1	11- 6	14- 1	16- 3	8- 3	10- 6	12-10	14-10
	Douglas fir-larch	#3	6-10	8- 8	10- 7	12- 4	6- 3	7-11	9- 8	11- 3
	Hem-fir	SS	9- 2	12- 1	15- 5	18- 9	9- 2	12- 1	15- 5	18- 9
	Hem-fir	#1	9- 0	11-10	14- 8	17- 0	8- 8	10-11	13- 4	15- 6
	Hem-fir	#2	8- 7	11- 3	13-10	16- 1	8- 2	10- 4	12- 8	14- 8
	Hem-fir	#3	6-10	8- 8	10- 7	12- 4	6- 3	7-11	9- 8	11- 3
	Southern pine	SS	9- 6	12- 7	16- 0	19- 6	9- 6	12- 7	16- 0	19- 6
	Southern pine	#1	9- 4	12- 4	15- 9	19- 2	9- 4	12- 4	14-11	17- 9
	Southern pine	#2	9- 2	12- 1	14- 8	17- 2	8- 8	11- 3	13- 5	15- 8
	Southern pine	#3	7- 4	9- 5	11- 1	13- 2	6- 9	8- 7	10- 1	12- 1
	Spruce-pine-fir	SS	9- 0	11-10	15- 1	18- 4	9- 0	11-10	15- 1	17- 9
	Spruce-pine-fir	#1	8- 9	11- 6	14- 1	16- 3	8- 3	10- 6	12-10	14-10
	Spruce-pine-fir	#2	8- 9	11- 6	14- 1	16- 3	8- 3	10- 6	12-10	14-10
	Spruce-pine-fir	#3	6-10	8- 8	10- 7	12- 4	6- 3	7-11	9- 8	11- 3
24	Douglas fir-larch	SS	9- 0	11-11	15- 2	18- 5	9- 0	11-11	14- 9	17- 1
	Douglas fir-larch	#1	8- 8	11- 0	13- 5	15- 7	7-11	10- 0	12- 3	14- 3
	Douglas fir-larch	#2	8- 1	10- 3	12- 7	14- 7	7- 5	9- 5	11- 6	13- 4
	Douglas fir-larch	#3	6- 2	7- 9	9- 6	11- 0	5- 7	7- 1	8- 8	10- 1
	Hem-fir	SS	8- 6	11- 3	14- 4	17- 5	8- 6	11- 3	14- 4	16-10 <sup>a</sup>
	Hem-fir	#1	8- 4	10- 9	13- 1	15- 2	7- 9	9- 9	11-11	13-10
	Hem-fir	#2	7-11	10- 2	12- 5	14- 4	7- 4	9- 3	11- 4	13- 1
	Hem-fir	#3	6- 2	7- 9	9- 6	11- 0	5- 7	7- 1	8- 8	10- 1
	Southern pine	SS	8-10	11- 8	14-11	18- 1	8-10	11- 8	14-11	18- 1
	Southern pine	#1	8- 8	11- 5	14- 7	17- 5	8- 8	11- 3	13- 4	15-11
	Southern pine	#2	8- 6	11- 0	13- 1	15- 5	7- 9	10- 0	12- 0	14- 0
	Southern pine	#3	6- 7	8- 5	9-11	11-10	6- 0	7- 8	9- 1	10- 9
	Spruce-pine-fir	SS	8- 4	11- 0	14- 0	17- 0	8- 4	11- 0	13- 8	15-11
	Spruce-pine-fir	#1	8- 1	10- 3	12- 7	14- 7	7- 5	9- 5	11- 6	13- 4
	Spruce-pine-fir	#2	8- 1	10- 3	12- 7	14- 7	7- 5	9- 5	11- 6	13- 4
	Spruce-pine-fir	#3	6- 2	7- 9	9- 6	11- 0	5- 7	7- 1	8- 8	10- 1

Check sources for availability of lumber in lengths greater than 20 feet.

For SI: 1 inch = 25.4 mm, 1 foot = 308.4 mm, 1 pound per square foot = 0.0479 kN/m.

a. End bearing length shall be increased to 2 inches.



TABLE R502.3.3(1)  
**CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING LIGHT-FRAME EXTERIOR BEARING WALL AND ROOF ONLY<sup>a, b, c, f, g, h</sup>**  
 → (Floor Live Load ≤ 40 psf, Roof Live Load ≤ 20 psf) ←

Member & Spacing	Maximum Cantilever Span (Uplift Force at Backspan Support in Lbs.) <sup>d, e</sup>											
	Ground Snow Load											
	≤ 20 psf			30 psf			50 psf			70 psf		
	Roof Width			Roof Width			Roof Width			Roof Width		
	24 ft.	32 ft.	40 ft.	24 ft.	32 ft.	40 ft.	24 ft.	32 ft.	40 ft.	24 ft.	32 ft.	40 ft.
× 8 @ 12"	20" (177)	15" (227)	—	18" (209)	—	—	—	—	—	—	—	—
× 10 @ 16"	29" (228)	21" (297)	16" (364)	26" (271)	18" (354)	—	20" (375)	—	—	—	—	—
× 10 @ 12"	36" (166)	26" (219)	20" (270)	34" (198)	22" (263)	16" (324)	26" (277)	—	—	19" (356)	—	—
× 12 @ 16"	—	32" (287)	25" (356)	36" (263)	29" (345)	21" (428)	29" (367)	20" (484)	—	23" (471)	—	—
× 12 @ 12"	—	42" (209)	31" (263)	—	37" (253)	27" (317)	36" (271)	27" (358)	17" (447)	31" (348)	19" (462)	—
× 12 @ 8"	—	48" (136)	45" (169)	—	48" (164)	38" (206)	—	40" (233)	26" (294)	36" (230)	29" (304)	18" (379)

SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

Tabulated values are for clear-span roof supported solely by exterior bearing walls.

Spans are based on No. 2 Grade lumber of Douglas fir-larch, hem-fir, southern pine, and spruce-pine-fir for repetitive (3 or more) members.

Ratio of backspan to cantilever span shall be at least 3:1. ✱

Connections capable of resisting the indicated uplift force shall be provided at the backspan support.

Uplift force is for a backspan to cantilever span ratio of 3:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 3 divided by the actual backspan ratio provided (3/backspan ratio).

See Section R301.2.2.7.1 for additional limitations on cantilevered floor joists for detached one- and two-family dwellings in Seismic Design Categories D<sub>1</sub> and D<sub>2</sub> and townhouses in Seismic Design Categories C, D<sub>1</sub>, and D<sub>2</sub>.

A full-depth rim joist shall be provided at the cantilevered end of the joists. Solid blocking shall be provided at the cantilever support. ✱

Linear interpolation shall be permitted for building widths and ground snow loads other than shown.

TABLE R502.3.3(2)  
**CANTILEVER SPANS FOR FLOOR JOISTS SUPPORTING EXTERIOR BALCONY<sup>a, b, e, f</sup>**

Member Size	Spacing	Maximum Cantilever Span (Uplift Force at Backspan Support in Lbs.) <sup>c, d</sup>		
		Ground Snow Load		
		≤ 30 psf	50 psf	70 psf
2 × 8	12"	42" (139)	39" (156)	34" (165)
2 × 8	16"	36" (151)	34" (171)	29" (180)
2 × 10	12"	61" (164)	57" (189)	49" (201)
2 × 10	16"	53" (180)	49" (208)	42" (220)
2 × 10	24"	43" (212)	40" (241)	34" (255)
2 × 12	16"	72" (228)	67" (260)	57" (268)
2 × 12	24"	58" (279)	54" (319)	47" (330)

SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

Spans are based on No. 2 Grade lumber of Douglas fir-larch, hem-fir, southern pine, and spruce-pine-fir for repetitive (3 or more) members.

Ratio of backspan to cantilever span shall be at least 2:1. ✱

Connections capable of resisting the indicated uplift force shall be provided at the backspan support.

Uplift force is for a backspan to cantilever span ratio of 2:1. Tabulated uplift values are permitted to be reduced by multiplying by a factor equal to 2 divided by the actual backspan ratio provided (2/backspan ratio).

A full-depth rim joist shall be provided at the cantilevered end of the joists. Solid blocking shall be provided at the cantilevered support.

Linear interpolation shall be permitted for ground snow loads other than shown.



## ROOF-CEILING CONSTRUCTION

TABLE R802.5.1(3)  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground snow load=30 psf, ceiling not attached to rafters, L/Δ=180)

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans*									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	10-0	15-9	20-9	Note b	Note b	10-0	15-9	20-1	24-6	Note b
	Douglas fir-larch #1	9-8	14-9	18-8	22-9	Note b	9-0	13-2	16-8	20-4	23-7
	Douglas fir-larch #2	9-5	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Douglas fir-larch #3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Hem-fir SS	9-6	14-10	19-7	25-0	Note b	9-6	14-10	19-7	24-1	Note b
	Hem-fir #1	9-3	14-4	18-2	22-2	25-9	8-9	12-10	16-3	19-10	23-0
	Hem-fir #2	8-10	13-7	17-2	21-0	24-4	8-4	12-2	15-4	18-9	21-9
	Hem-fir #3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Southern pine SS	9-10	15-6	20-5	Note b	Note b	9-10	15-6	20-5	Note b	Note b
	Southern pine #1	9-8	15-2	20-0	24-9	Note b	9-8	14-10	18-8	22-2	Note b
	Southern pine #2	9-6	14-5	18-8	22-3	Note b	9-0	12-11	16-8	19-11	23-4
	Southern pine #3	7-7	11-2	14-3	16-10	20-0	6-9	10-0	12-9	15-1	17-11
	Spruce-pine-fir SS	9-3	14-7	19-2	24-6	Note b	9-3	14-7	18-8	22-9	Note b
	Spruce-pine-fir #1	9-1	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Spruce-pine-fir #2	9-1	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Spruce-pine-fir #3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
16	Douglas fir-larch SS	9-1	14-4	18-10	23-9	Note b	9-1	13-9	17-5	21-3	24-8
	Douglas fir-larch #1	8-9	12-9	16-2	19-9	22-10	7-10	11-5	14-5	17-8	20-5
	Douglas fir-larch #2	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Douglas fir-larch #3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Hem-fir SS	8-7	13-6	17-10	22-9	Note b	8-7	13-6	17-1	20-10	24-2
	Hem-fir #1	8-5	12-5	15-9	19-3	22-3	7-7	11-1	14-1	17-2	19-11
	Hem-fir #2	8-0	11-9	14-11	18-2	21-1	7-2	10-6	13-4	16-3	18-10
	Hem-fir #3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Southern pine SS	8-11	14-1	18-6	23-8	Note b	8-11	14-1	18-6	23-8	Note b
	Southern pine #1	8-9	13-9	18-1	21-5	25-7	8-8	12-10	16-2	19-2	22-10
	Southern pine #2	8-7	12-6	16-2	19-3	22-7	7-10	11-2	14-5	17-3	20-2
	Southern pine #3	6-7	9-8	12-4	14-7	17-4	5-10	8-8	11-0	13-0	15-6
	Spruce-pine-fir SS	8-5	13-3	17-5	22-1	25-7	8-5	12-9	16-2	19-9	22-10
	Spruce-pine-fir #1	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir #2	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-pine-fir #3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
19.2	Douglas fir-larch SS	8-7	13-6	17-9	21-8	25-2	8-7	12-6	15-10	19-5	22-6
	Douglas fir-larch #1	7-11	11-8	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Douglas fir-larch #2	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Douglas fir-larch #3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
	Hem-fir SS	8-1	12-9	16-9	21-4	24-8	8-1	12-4	15-7	19-1	22-1
	Hem-fir #1	7-9	11-4	14-4	17-7	20-4	6-11	10-2	12-10	15-8	18-2
	Hem-fir #2	7-4	10-9	13-7	16-7	19-3	6-7	9-7	12-2	14-10	17-3
	Hem-fir #3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
	Southern pine SS	8-5	13-3	17-5	22-3	Note b	8-5	13-3	17-5	22-0	25-9
	Southern pine #1	8-3	13-0	16-6	19-7	23-4	7-11	11-9	14-9	17-6	20-11
	Southern pine #2	7-11	11-5	14-9	17-7	20-7	7-1	10-2	13-2	15-9	18-5
	Southern pine #3	6-0	8-10	11-3	13-4	15-10	5-4	7-11	10-1	11-11	14-2
	Spruce-pine-fir SS	7-11	12-5	16-5	20-2	23-4	7-11	11-8	14-9	18-0	20-11
	Spruce-pine-fir #1	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir #2	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-pine-fir #3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2

(continued)

## ROOF-CEILING CONSTRUCTION

TABLE R802.5.1(3)—continued  
 RAFTER SPANS FOR COMMON LUMBER SPECIES  
 (Ground snow load=30 psf, ceiling not attached to rafters,  $L/\Delta=180$ )

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans <sup>a</sup>									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
24	Douglas fir-larch SS	7-11	12-6	15-10	19-5	22-6	7-8	11-3	14-2	17-4	20-1
	Douglas fir-larch #1	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Douglas fir-larch #2	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Douglas fir-larch #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Hem-fir SS	7-6	11-10	15-7	19-1	22-1	7-6	11-0	13-11	17-0	19-9
	Hem-fir #1	6-11	10-2	12-10	15-8	18-2	6-2	9-1	11-6	14-0	16-3
	Hem-fir #2	6-7	9-7	12-2	14-10	17-3	5-10	8-7	10-10	13-3	15-5
	Hem-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Southern pine SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	19-8	23-0
	Southern pine #1	7-8	11-9	14-9	17-6	20-11	7-1	10-6	13-2	15-8	18-8
	Southern pine #2	7-1	10-2	13-2	15-9	18-5	6-4	9-2	11-9	14-1	16-6
	Southern pine #3	5-4	7-11	10-1	11-11	14-2	4-9	7-1	9-0	10-8	12-8
	Spruce-pine-fir SS	7-4	11-7	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Spruce-pine-fir #1	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #2	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10

Check sources for availability of lumber in lengths greater than 20 feet.

or SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the factors given below:

$H_C/H_R$	Rafter Span Adjustment Factor
2/3 or greater	0.50
1/2	0.58
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 and less	1.00

where:  $H_C$  = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

$H_R$  = Height of roof ridge measured vertically above the top of the rafter support walls.

Span exceeds 26 feet in length.

## ROOF-CEILING CONSTRUCTION

✓ 02/15

TABLE R802.5.1(5)  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground snow load=30 psf, ceiling attached to rafters,  $L/\Delta=240$ )

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans <sup>a</sup>									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch SS	9- 1	14- 4	18-10	24- 1	Note b	9- 1	14- 4	18-10	24- 1	Note b
	Douglas fir-larch #1	8- 9	13- 9	18- 2	22- 9	Note b	8- 9	13- 2	16- 8	20- 4	23- 7
	Douglas fir-larch #2	8- 7	13- 6	17- 5	21- 4	24- 8	8- 5	12- 4	15- 7	19- 1	22- 1
	Douglas fir-larch #3	7- 1	10- 5	13- 2	16- 1	18- 8	6- 4	9- 4	11- 9	14- 5	16- 8
	Hem-fir SS	8- 7	13- 6	17-10	22- 9	Note b	8- 7	13- 6	17-10	22- 9	Note b
	Hem-fir #1	8- 5	13- 3	17- 5	22- 2	25- 9	8- 5	12-10	16- 3	19-10	23- 0
	Hem-fir #2	8- 0	12- 7	16- 7	21- 0	24- 4	8- 0	12- 2	15- 4	18- 9	21- 9
	Hem-fir #3	7- 1	10- 5	13- 2	16- 1	18- 8	6- 4	9- 4	11- 9	14- 5	16- 8
	Southern pine SS	8-11	14- 1	18- 6	23- 8	Note b	8-11	14- 1	18- 6	23- 8	Note b
	Southern pine #1	8- 9	13- 9	18- 2	23- 2	Note b	8- 9	13- 9	18- 2	22- 2	Note b
	Southern pine #2	8- 7	13- 6	17-10	22- 3	Note b	8- 7	12-11	16- 8	19-11	23- 4
	Southern pine #3	7- 7	11- 2	14- 3	16-10	20- 0	6- 9	10- 0	12- 9	15- 1	17-11
	Spruce-pine-fir SS	8- 5	13- 3	17- 5	22- 3	Note b	8- 5	13- 3	17- 5	22- 3	Note b
	Spruce-pine-fir #1	8- 3	12-11	17- 0	21- 4	24- 8	8- 3	12- 4	15- 7	19- 1	22- 1
	Spruce-pine-fir #2	8- 3	12-11	17- 0	21- 4	24- 8	8- 3	12- 4	15- 7	19- 1	22- 1
	Spruce-pine-fir #3	7- 1	10- 5	13- 2	16- 1	18- 8	6- 4	9- 4	11- 9	14- 5	16- 8
16	Douglas fir-larch SS	8- 3	13- 0	17- 2	21-10	Note b	8- 3	13- 0	17- 2	21- 3	24- 8
	Douglas fir-larch #1	8- 0	12- 6	16- 2	19- 9	22-10	7-10	11- 5	14- 5	17- 8	20- 5
	Douglas fir-larch #2	7-10	11-11	15- 1	18- 5	21- 5	7- 3	10- 8	13- 6	16- 6	19- 2
	Douglas fir-larch #3	6- 2	9- 0	11- 5	13-11	16- 2	5- 6	8- 1	10- 3	12- 6	14- 6
	Hem-fir SS	7-10	12- 3	16- 2	20- 8	25- 1	7-10	12- 3	16- 2	20- 8	24- 2
	Hem-fir #1	7- 8	12- 0	15- 9	19- 3	22- 3	7- 7	11- 1	14- 1	17- 2	19-11
	Hem-fir #2	7- 3	11- 5	14-11	18- 2	21- 1	7- 2	10- 6	13- 4	16- 3	18-10
	Hem-fir #3	6- 2	9- 0	11- 5	13-11	16- 2	5- 6	8- 1	10- 3	12- 6	14- 6
	Southern pine SS	8- 1	12- 9	16-10	21- 6	Note b	8- 1	12- 9	16-10	21- 6	Note b
	Southern pine #1	8- 0	12- 6	16- 6	21- 1	25- 7	8- 0	12- 6	16- 2	19- 2	22-10
	Southern pine #2	7-10	12- 3	16- 2	19- 3	22- 7	7-10	11- 2	14- 5	17- 3	20- 2
	Southern pine #3	6- 7	9- 8	12- 4	14- 7	17- 4	5-10	8- 8	11- 0	13- 0	15- 6
	Spruce-pine-fir SS	7- 8	12- 0	15-10	20- 2	24- 7	7- 8	12- 0	15-10	19- 9	22-10
	Spruce-pine-fir #1	7- 6	11- 9	15- 1	18- 5	21- 5	7- 3	10- 8	13- 6	16- 6	19- 2
	Spruce-pine-fir #2	7- 6	11- 9	15- 1	18- 5	21- 5	7- 3	10- 8	13- 6	16- 6	19- 2
	Spruce-pine-fir #3	6- 2	9- 0	11- 5	13-11	16- 2	5- 6	8- 1	10- 3	12- 6	14- 6
19.2	Douglas fir-larch SS	7- 9	12- 3	16- 1	20- 7	25- 0	7- 9	12- 3	15-10	19- 5	22- 6
	Douglas fir-larch #1	7- 6	11- 8	14- 9	18- 0	20-11	7- 1	10- 5	13- 2	16- 1	18- 8
	Douglas fir-larch #2	7- 4	10-11	13- 9	16-10	19- 6	6- 8	9- 9	12- 4	15- 1	17- 6
	Douglas fir-larch #3	5- 7	8- 3	10- 5	12- 9	14- 9	5- 0	7- 4	9- 4	11- 5	13- 2
	Hem-fir SS	7- 4	11- 7	15- 3	19- 5	23- 7	7- 4	11- 7	15- 3	19- 1	22- 1
	Hem-fir #1	7- 2	11- 4	14- 4	17- 7	20- 4	6-11	10- 2	12-10	15- 8	18- 2
	Hem-fir #2	6-10	10- 9	13- 7	16- 7	19- 3	6- 7	9- 7	12- 2	14-10	17- 3
	Hem-fir #3	5- 7	8- 3	10- 5	12- 9	14- 9	5- 0	7- 4	9- 4	11- 5	13- 2
	Southern pine SS	7- 8	12- 0	15-10	20- 2	24- 7	7- 8	12- 0	15-10	20- 2	24- 7
	Southern pine #1	7- 6	11- 9	15- 6	19- 7	23- 4	7- 6	11- 9	14- 9	17- 6	20-11
	Southern pine #2	7- 4	11- 5	14- 9	17- 7	20- 7	7- 1	10- 2	13- 2	15- 9	18- 5
	Southern pine #3	6- 0	8-10	11- 3	13- 4	15-10	5- 4	7-11	10- 1	11-11	14- 2
	Spruce-pine-fir SS	7- 2	11- 4	14-11	19- 0	23- 1	7- 2	11- 4	14- 9	18- 0	20-11
	Spruce-pine-fir #1	7- 0	10-11	13- 9	16-10	19- 6	6- 8	9- 9	12- 4	15- 1	17- 6
	Spruce-pine-fir #2	7- 0	10-11	13- 9	16-10	19- 6	6- 8	9- 9	12- 4	15- 1	17- 6
	Spruce-pine-fir #3	5- 7	8- 3	10- 5	12- 9	14- 9	5- 0	7- 4	9- 4	11- 5	13- 2

(continued)

## ROOF-CEILING CONSTRUCTION

TABLE R802.5.1(5)—continued  
 RAFTER SPANS FOR COMMON LUMBER SPECIES  
 (Ground snow load=30 psf, ceiling attached to rafters, L/Δ=240)

RAFTER SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2x4	2x6	2x8	2x10	2x12	2x4	2x6	2x8	2x10	2x12
		Maximum rafter spans <sup>a</sup>									
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
24	Douglas fir-larch SS	7-3	11-4	15-0	19-1	22-6	7-3	11-3	14-2	17-4	20-1
	Douglas fir-larch #1	7-0	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Douglas fir-larch #2	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Douglas fir-larch #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Hem-fir SS	6-10	10-9	14-2	18-0	21-11	6-10	10-9	13-11	17-0	19-9
	Hem-fir #1	6-8	10-2	12-10	15-8	18-2	6-2	9-1	11-6	14-0	16-3
	Hem-fir #2	6-4	9-7	12-2	14-10	17-3	5-10	8-7	10-10	13-3	15-5
	Hem-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Southern pine SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	18-9	22-10
	Southern pine #1	7-0	10-11	14-5	17-6	20-11	7-0	10-6	13-2	15-8	18-8
	Southern pine #2	6-10	10-2	13-2	15-9	18-5	6-4	9-2	11-9	14-1	16-6
	Southern pine #3	5-4	7-11	10-1	11-11	14-2	4-9	7-1	9-0	10-8	12-8
	Spruce-pine-fir SS	6-8	10-6	13-10	17-8	20-11	6-8	10-5	13-2	16-1	18-8
	Spruce-pine-fir #1	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #2	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-pine-fir #3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10

Check sources for availability of lumber in lengths greater than 20 feet.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- a. The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the factors given below:

$H_C/H_R$	Rafter Span Adjustment Factor
2/3 or greater	0.50
1/2	0.58
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 and less	1.00

where:  $H_C$  = Height of ceiling joists or rafter ties measured vertically above the top of the rafter support walls.

$H_R$  = Height of roof ridge measured vertically above the top of the rafter support walls.

- b. Span exceeds 26 feet in length.

## WALL CONSTRUCTION

✕ TABLE R602.3.1  
 MAXIMUM ALLOWABLE LENGTH OF WOOD WALL STUDS EXPOSED TO WIND SPEEDS OF 100 MPH OR LESS  
 IN SEISMIC DESIGN CATEGORIES A, B, C and D<sub>1</sub><sup>b,c</sup>

HEIGHT (feet)	ON-CENTER SPACING (inches)			
	24	16	12	8
<b>Supporting a roof only</b>				
>10	2×4	2×4	2×4	2×4
12	2×6	2×4	2×4	2×4
14	2×6	2×6	2×6	2×4
16	2×6	2×6	2×6	2×4
18	NA <sup>a</sup>	2×6	2×6	2×6
20	NA <sup>a</sup>	NA <sup>a</sup>	2×6	2×6
24	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	2×6
<b>Supporting one floor and a roof</b>				
>10	2×6	2×4	2×4	2×4
12	2×6	2×6	2×6	2×4
14	2×6	2×6	2×6	2×6
16	NA <sup>a</sup>	2×6	2×6	2×6
18	NA <sup>a</sup>	2×6	2×6	2×6
20	NA <sup>a</sup>	NA <sup>a</sup>	2×6	2×6
24	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	2×6
<b>Supporting two floors and a roof</b>				
>10	2×6	2×6	2×4	2×4
12	2×6	2×6	2×6	2×6
14	2×6	2×6	2×6	2×6
16	NA <sup>a</sup>	NA <sup>a</sup>	2×6	2×6
18	NA <sup>a</sup>	NA <sup>a</sup>	2×6	2×6
20	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	2×6
22	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>
24	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>	NA <sup>a</sup>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>, 1 pound per square inch = 6.895 kPa, 1 mile per hour = 1.609 km/h.

a. Design required.

b. Applicability of this table assumes the following: Snow load not exceeding 25 psf,  $f_b$  not less than 1310 psi determined by multiplying the AF&PA NDS tabular base design value by the repetitive use factor, and by the size factor for all species except southern pine, E not less than 1.6 by 10<sup>6</sup> psi, tributary dimensions for floors and roofs not exceeding 6 feet, maximum span for floors and roof not exceeding 12 feet, eaves not greater than 2 feet in dimension and exterior sheathing.

→ Where the conditions are not within these parameters, design is required. ←

c. Utility, standard, stud and No. 3 grade lumber of any species are not permitted.

(continued)

✱  
TABLE R602.3(5)  
SIZE, HEIGHT AND SPACING OF WOOD STUDS<sup>a</sup>

STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height <sup>a</sup> (feet)	Maximum spacing when supporting roof and ceiling only (inches)	Maximum spacing when supporting one floor, roof and ceiling (inches)	Maximum spacing when supporting two floors, roof and ceiling (inches)	Maximum spacing when supporting one floor only (inches)	Laterally unsupported stud height <sup>a</sup> (feet)	Maximum spacing (inches)
2 × 3 <sup>b</sup>	—	—	—	—	—	10	16
2 × 4	10	24	16	—	24	14	24
3 × 4	10	24	24	16	24	14	24
2 × 5	10	24	24	—	24	16	24
2 × 6	10	24	24	16	24	20	24

For SI: 1 inch = 25.4 mm.

1. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by analysis.
2. Shall not be used in exterior walls.

## Wall Construction

ings located in Seismic Design Categories D<sub>1</sub> and D<sub>2</sub> shall be in accordance with Sections R602.11.1 through R602.11.3.

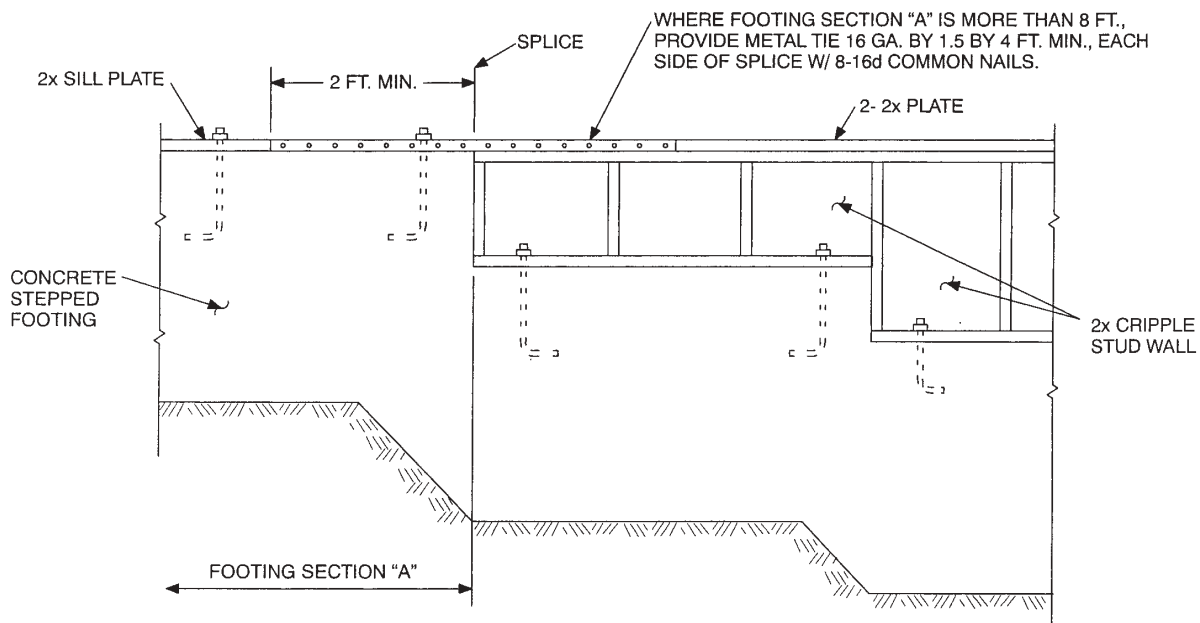
**R602.11.1 Wall anchorage.** Braced wall line sills shall be anchored to concrete or masonry foundations in accordance with Sections R403.1.6 and R602.11. For all buildings in Seismic Design Categories D<sub>1</sub> and D<sub>2</sub> and townhouses in Seismic Design Category C, plate washers, a minimum of  $\frac{3}{16}$  inch by 2 inches by 2 inches (6.4 mm by 76 mm by 76 mm) in size, shall be provided between the foundation sill plate and the nut.

**R602.11.2 Interior braced wall panel connections.** Interior braced wall lines shall be fastened to floor and roof framing in accordance with Table R602.3(1), to required foundations in accordance with Section R602.11.1, and in accordance with the following requirements:

1. Floor joists parallel to the top plate shall be toe-nailed to the top plate with at least 8d nails spaced a maximum of 6 inches (150 mm) on center.
2. Top plate laps shall be face-nailed with at least eight 16d nails on each side of the splice.

**R602.11.3 Stepped foundations.** Where stepped foundations occur, the following requirements apply:

1. Where the height of a required braced wall panel that extends from foundation to floor above varies more than 4 feet (1220 mm), the braced wall panel shall be constructed in accordance with Figure R602.11.3.
2. Where the lowest floor framing rests directly on a sill bolted to a foundation not less than 8 feet (2440 mm) in length along a line of bracing, the line shall be considered as braced. The double plate of the cripple stud wall beyond the segment of footing that extends to the lowest framed floor shall be spliced by extending the upper top plate a minimum of 4 feet (1219 mm) along the foundation. Anchor bolts shall be located a maximum of 1 foot and 3 feet (305 and 914 mm) from the step in the foundation.
3. Where cripple walls occur between the top of the foundation and the lowest floor framing, the bracing requirements for a story shall apply.
4. Where only the bottom of the foundation is stepped and the lowest floor framing rests directly on a sill bolted to the foundations, the requirements of Section R602.11.1 shall apply.

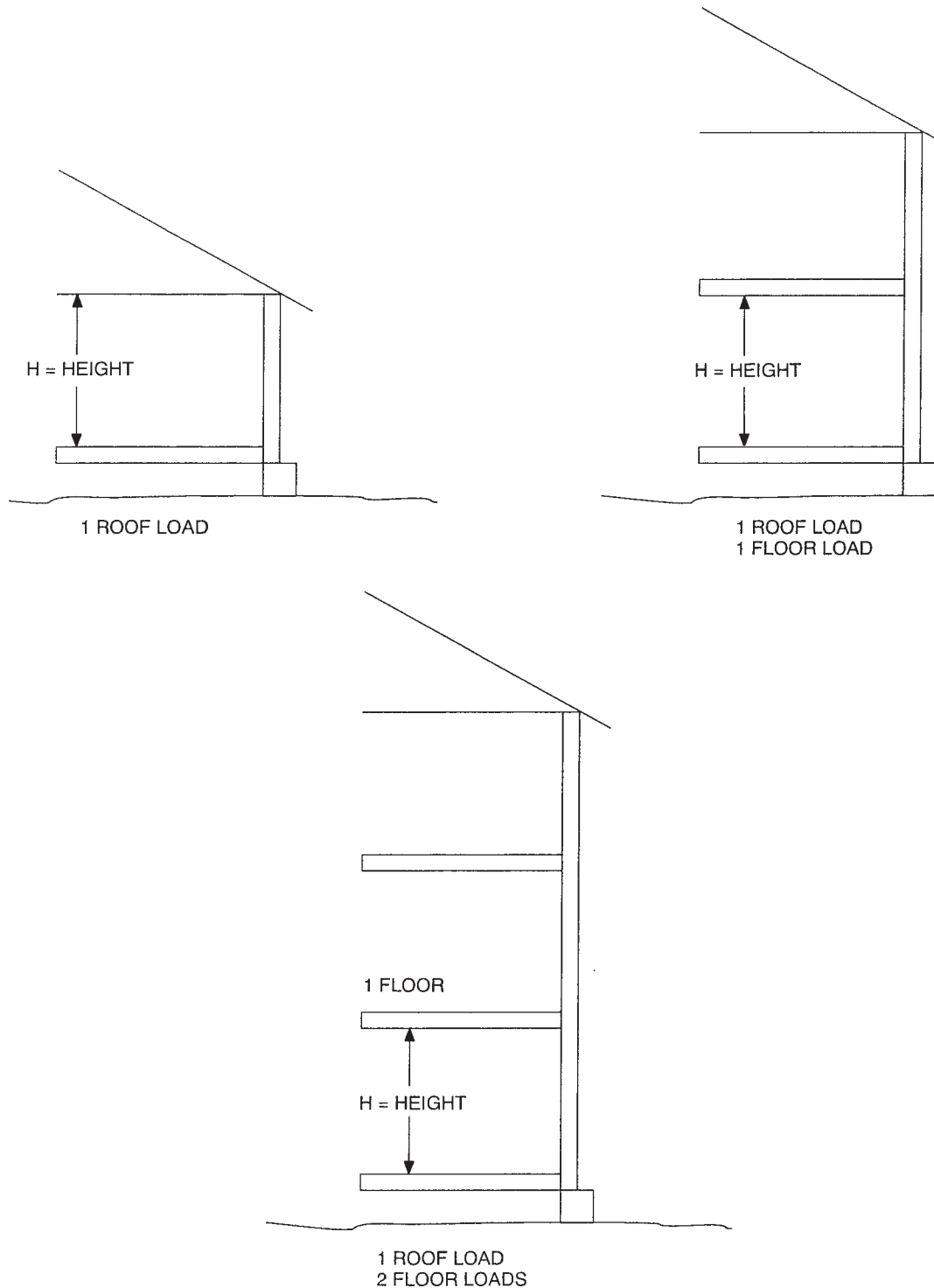


For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

**Note:** Where footing Section "A" is less than 8 feet long in a 25 feet total length wall, provide bracing at cripple stud wall.

**FIGURE R602.11.3**  
**STEPPED FOUNDATION CONSTRUCTION**

TABLE R602.3.1—continued  
MAXIMUM ALLOWABLE LENGTH OF WOOD WALL STUDS EXPOSED TO WIND SPEEDS OF 100 MPH  
OR LESS IN SEISMIC DESIGN CATEGORIES A, B, C and D





# Section Four: Prescriptive Design

Presented by John Greenheck

## Irregular Buildings

Shear Walls not in one plane vertically

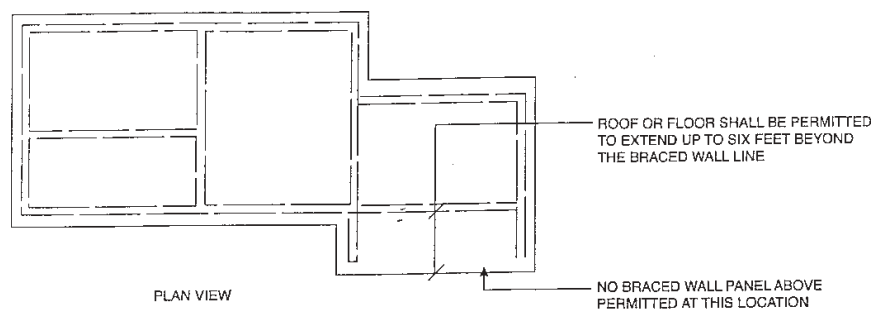
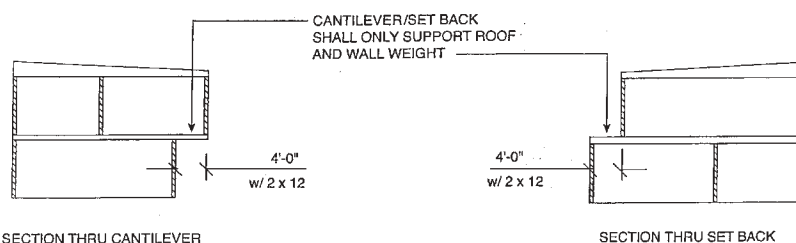


FIGURE 2308.12.6(1)  
BRACED WALL PANELS OUT OF PLANE

Figure 1

Exception for offset



For SI: 1 foot = 304.8 mm.

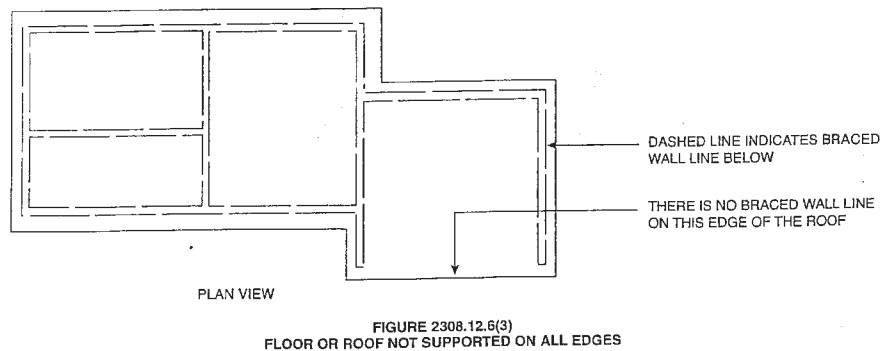
FIGURE 2308.12.6(2)  
BRACED WALL PANELS SUPPORTED BY CANTILEVER OR SET BACK

Figure 2

Exception Requirements

- 2x10 min. Floor Joists at 16" o.c.
- Back span of min 2:1
- Floor joists doubled at the end of braced panels
- Continuous or tied rim joist
- Loads of roof and wall only & 8' max header reactions

**When a section of floor or roof not laterally supported by shear walls or braced wall lines on all edges**



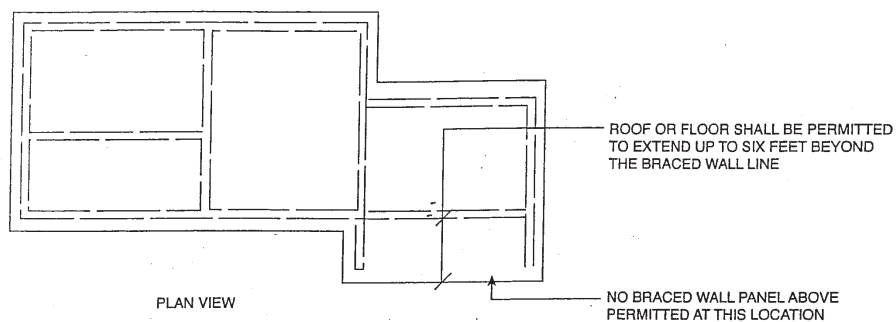
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511

Figure 3

Exception – up to six foot offset with no brace panels above.

WOOD



For SI: 1 foot = 304.8 mm.

FIGURE 2308.12.6(4)  
ROOF OR FLOOR EXTENSION BEYOND BRACED WALL LINE

Figure 4

## When the end of a braced wall panel occurs over an opening in the wall below more than one foot from the edge

Exception header requirements

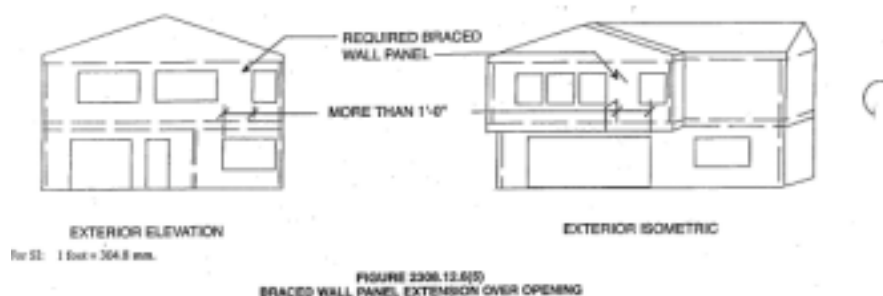


Figure 5

## When an opening in a floor or roof exceeds 12 feet or 50% of the least floor dimension

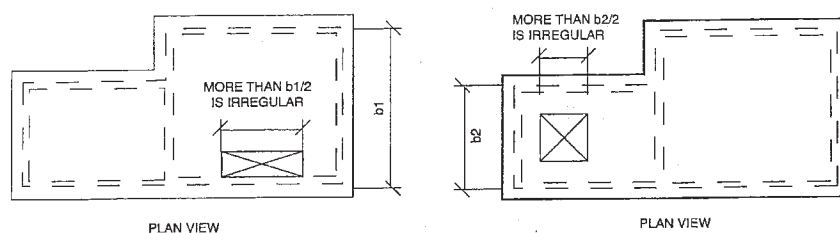


FIGURE 2308.12.6(8)  
OPENING LIMITATIONS FOR FLOOR AND ROOF DIAPHRAGMS

Figure 6

### When portions of floor level are vertically offset

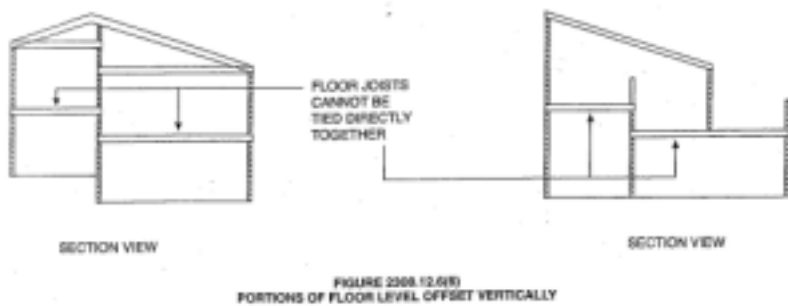


Figure 7

#### Exceptions:

Supported directly by continuous foundation at perimeter

When lapped or tied together per R502.6.1

### When shear walls and braced wall lines do not occur in two perpendicular directions

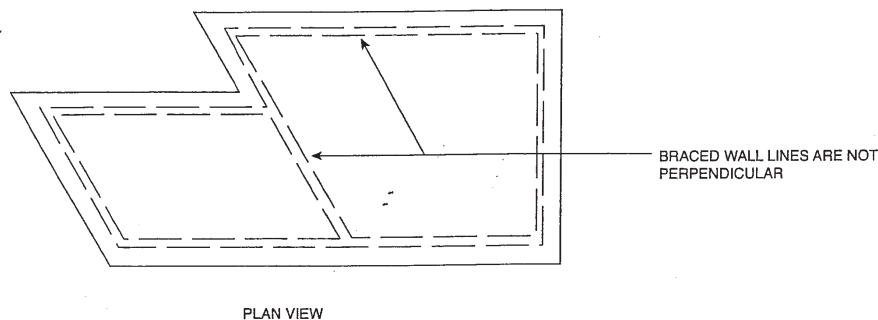


FIGURE 2308.12.6(7)  
BRACED WALL LINES NOT PERPENDICULAR

Figure 8

### When stories above grade partially or completely braced by wood wall framing include concrete or masonry construction

Exception – Fireplaces, chimneys and masonry veneer as permitted by the IRC  
When this irregularity applies, the entire story shall be engineered.

# Prescriptive Wall Bracing

## Braced wall lines spaced no more than 25' from one another

May be offset up to 35' for 1 room not more than 900 square feet.

Walls offset up to 35' require additional length of braced wall

For plans with dimension greater than 50', interior braced wall lines require continuous footings (R403.1.2)

Continuous footings require continuous reinforcement tied into perimeter footings

WOOD

Figure 9

SEISMIC DESIGN CATEGORY	MAXIMUM WALL SPACING (feet)	REQUIRED BRACING LENGTH, b
A, B, and C	35'-0"	Table 2308.9.3(1) and Section 2308.9.3
D and E	25'-0"	Table 2308.12.4

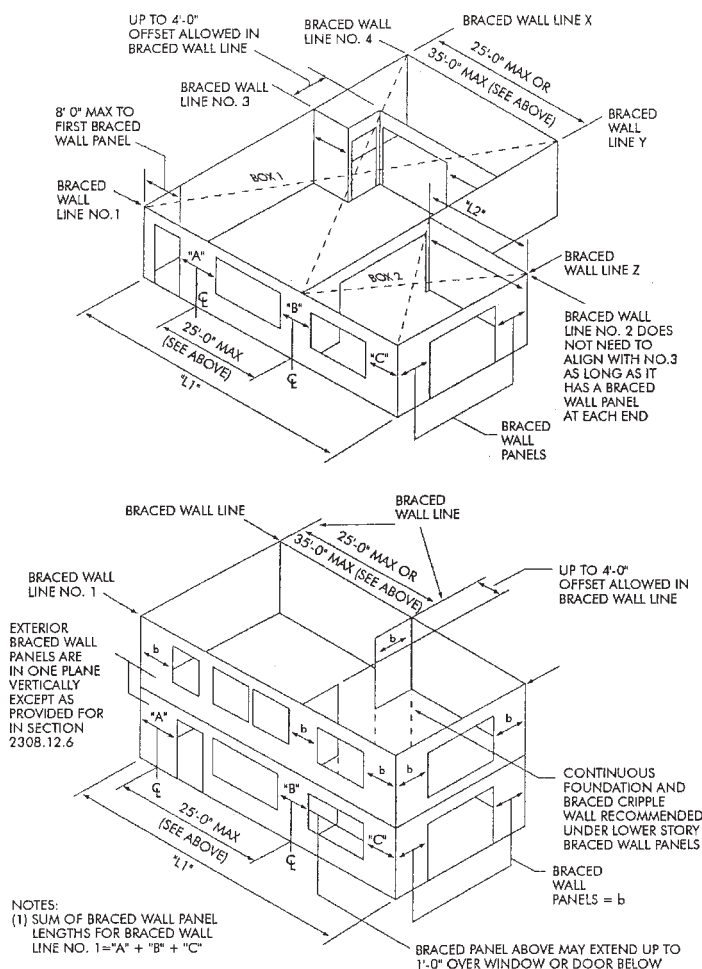


FIGURE 2308.9.3  
BASIC COMPONENTS OF THE LATERAL BRACING SYSTEM

SE: 1 ft = 304.8 mm

Braced Panels may be offset up to 4' in either direction and still be considered a part of the same braced wall line

**Amount of wall bracing required:**

Table R602.10.1

Method 3 – Plywood Braced Panels

One story or Top Story of two or three story

20% of wall length

First story of two story, or second story of three story

45% of wall length

First story of three story

60% of wall length

Note: Increased lengths if using other methods

**Braced wall panels:**

At each end of wall line & not more than 25' on center.

Braced panels can be up to 8 feet from the ends of the braced wall lines if one of the following:

A 24 inch panel is applied to each side of the building corner and attached per figure

R602.10.5 ( see Figure 10 on page 71)

**OR** End of each braced wall panel closest to the corner must have a 1,800 lb tie-down

If braced panel is more than 8 feet from each end of a brace wall line, a designed collector shall be provided (engineering required)

**Braced wall panel construction:**

At least 48 inches in length

3/8" min. plywood

8d Nails at 6" o.c. at edges, 12" o.c. field

**OR** 15 Ga. or 16 Ga. Staples at 6" o.c. edges, 12" o.c. field

Typical Detail

Vertical joints on studs, Horizontal joints on Blocking

**Alternate Braced Wall Panels:**

Typical Detail 2'-8" length

May replace a 4'-0" braced wall panel

1 story application (Typical Detail) (see Figure 11 on page 72)

8d nails at 6" o.c.

Block all edges

1,800 lb hold down

(2) 1/2" anchor bolts

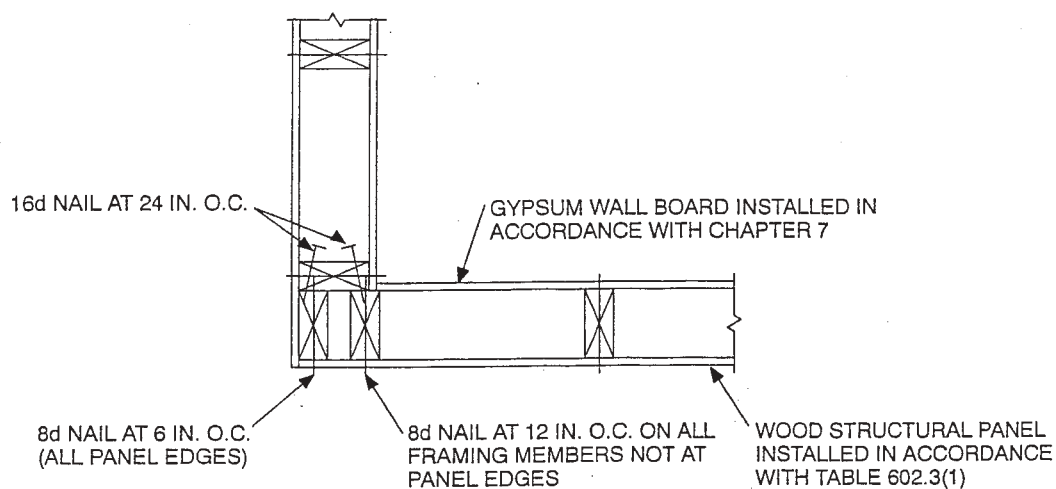
1<sup>st</sup> story of 2 story building (Typical Detail 2) (see Figure 12 on page 73)

Sheathing both sides of panel

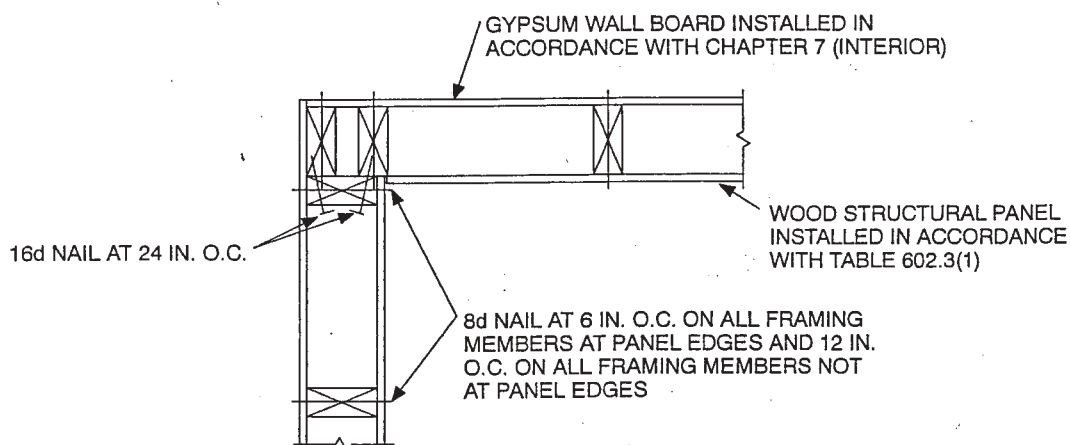
8d nails at 4" o.c.

Block all edges

3,000 lb hold down



(a) OUTSIDE CORNER DETAIL



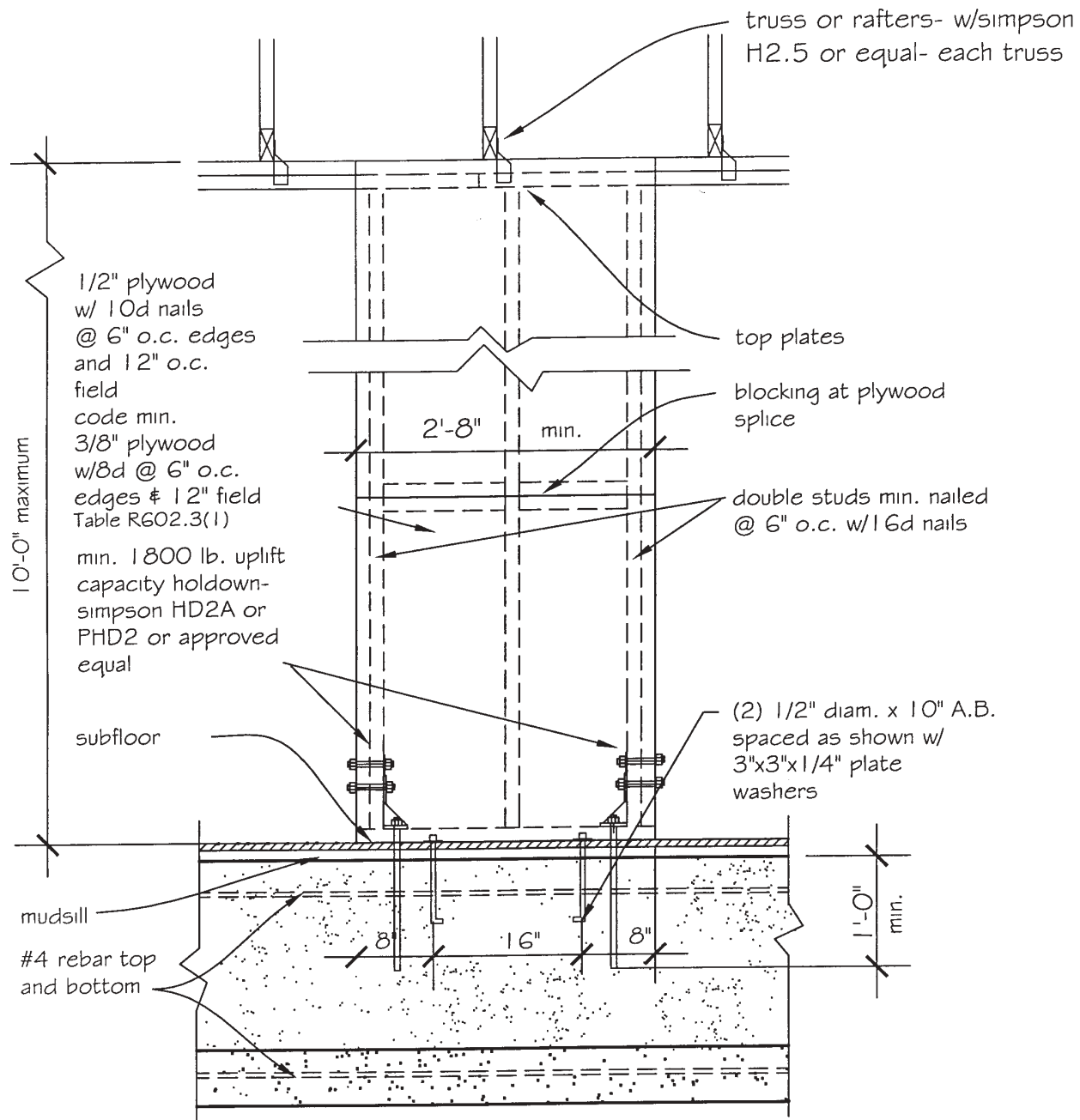
(b) INSIDE CORNER DETAIL

For SI: 1 inch = 25.4 mm.

**FIGURE R602.10.5**  
**EXTERIOR CORNER FRAMING**

**Figure 10**

Figure 11

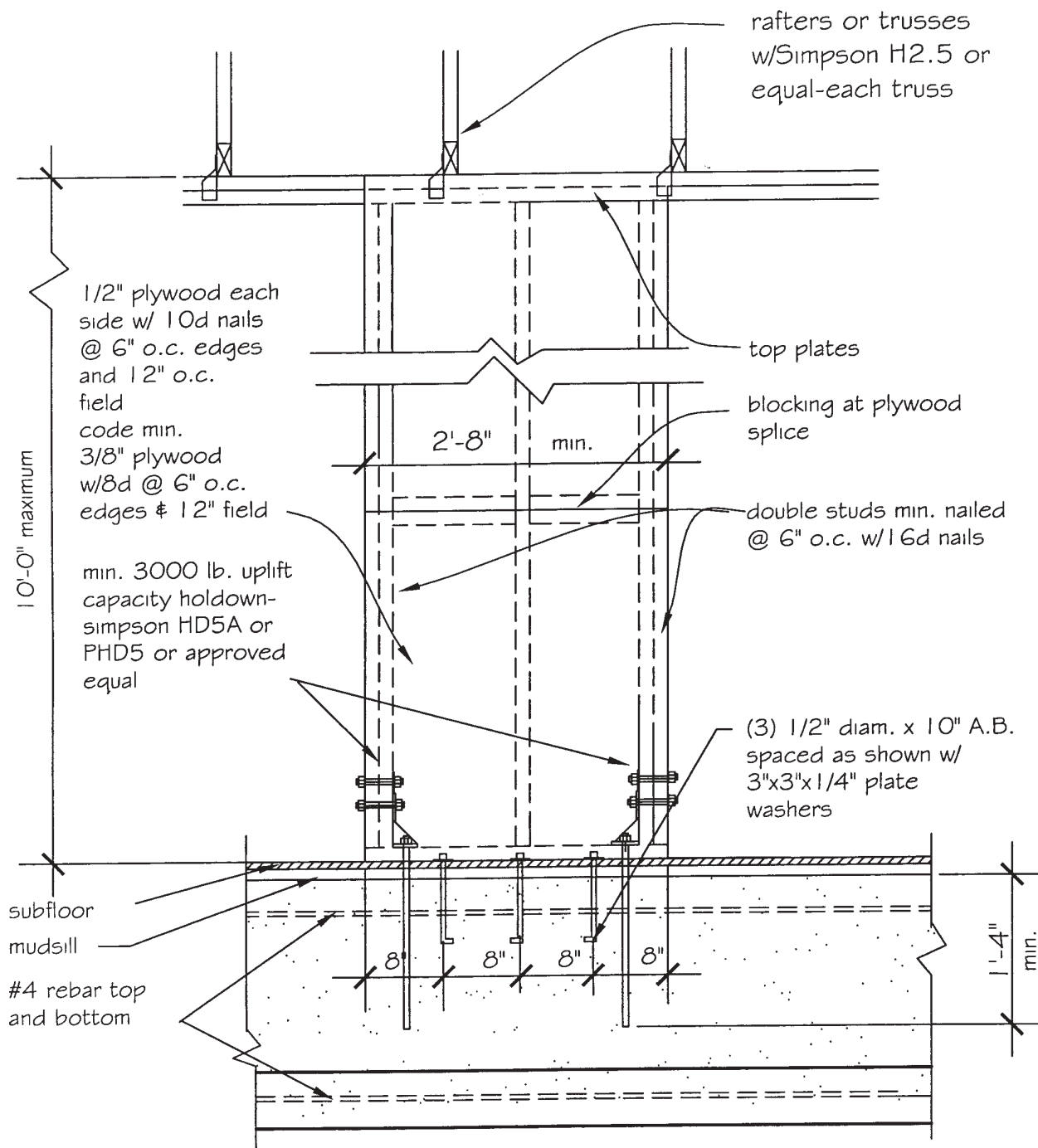


32" One Story Alternate Braced Wall Panel

R602.10.6-1



Figure 12



32" Alternate Braced Wall Panel  
First floor of a two story

R602.10.6-

### Continuous Structural Panel Sheathing

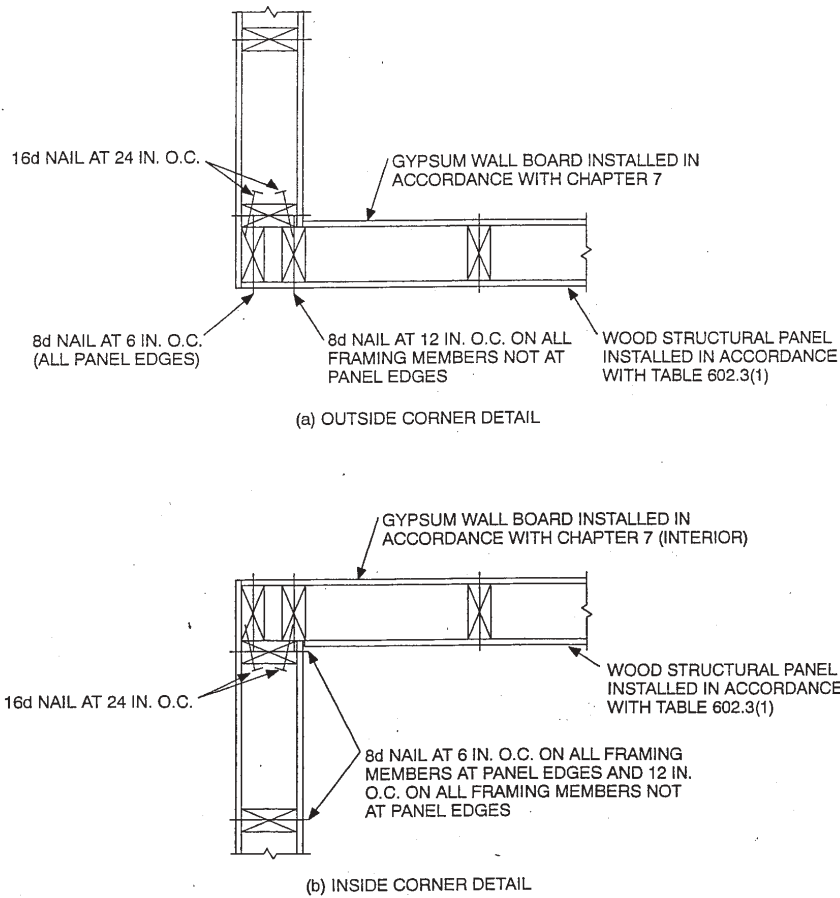
Plywood Panels on all sheathable areas of all exterior walls, and interior braced wall lines, where required, including areas above and below openings.

Reduces length of braced wall panels

Table R602.10.5

Reduces amount of bracing required by 10%-20%

Corners per Figure R602.10.5



For SI: 1 inch = 25.4 mm.

FIGURE R602.10.5  
EXTERIOR CORNER FRAMING

Figure 13

## Wall Anchorage R403.1.6

1/4"x3"x3" Plate washers

1/2" diameter anchor bolts a 6 feet on center

Anchor bolts at 4 feet on center for buildings over 2 stories

Anchor bolts located within 12 inches from the ends of each plate section

2 bolts per plate section

## Continuous Load Path

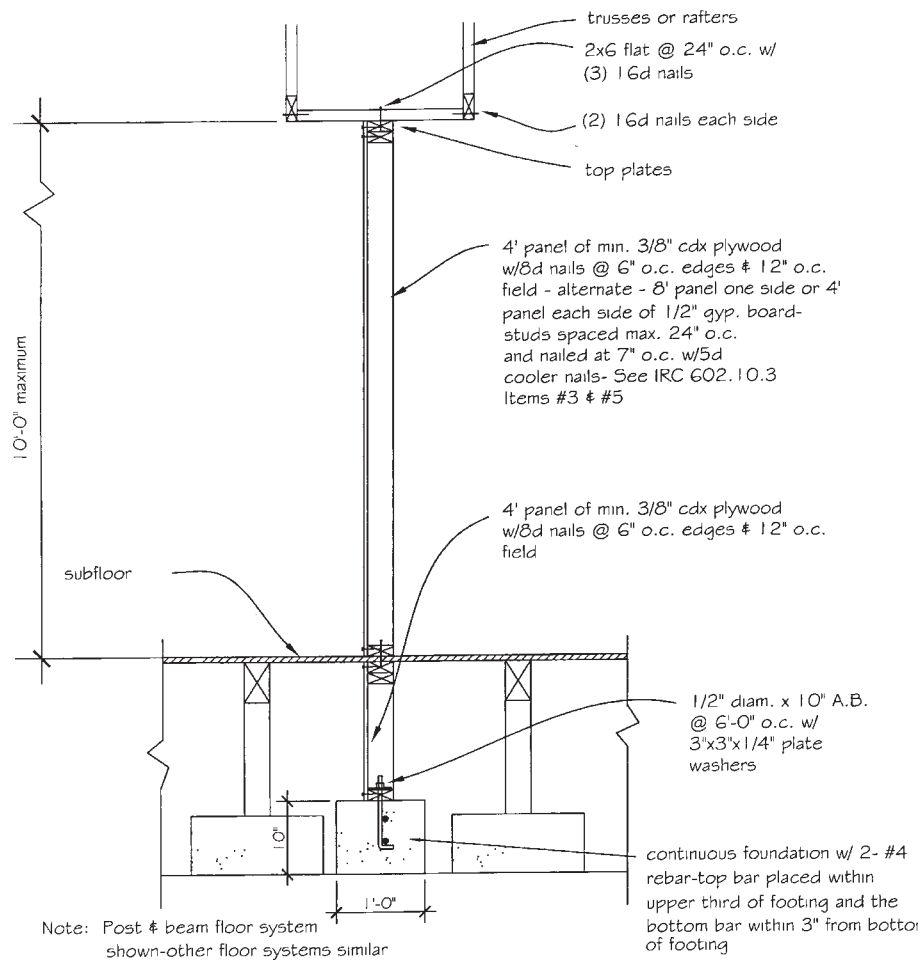
Per Chapter 3 of the IRC

"The construction of buildings and structures shall result in a system that provides a complete load path capable of transferring all loads from their point of origin through the load-resisting elements to the foundation" R301.1

Required interior braced wall panels in buildings with plan dimensions greater than 50 feet shall also be supported by continuous footings. R403.1.2

Interior braced panels

Figure 14



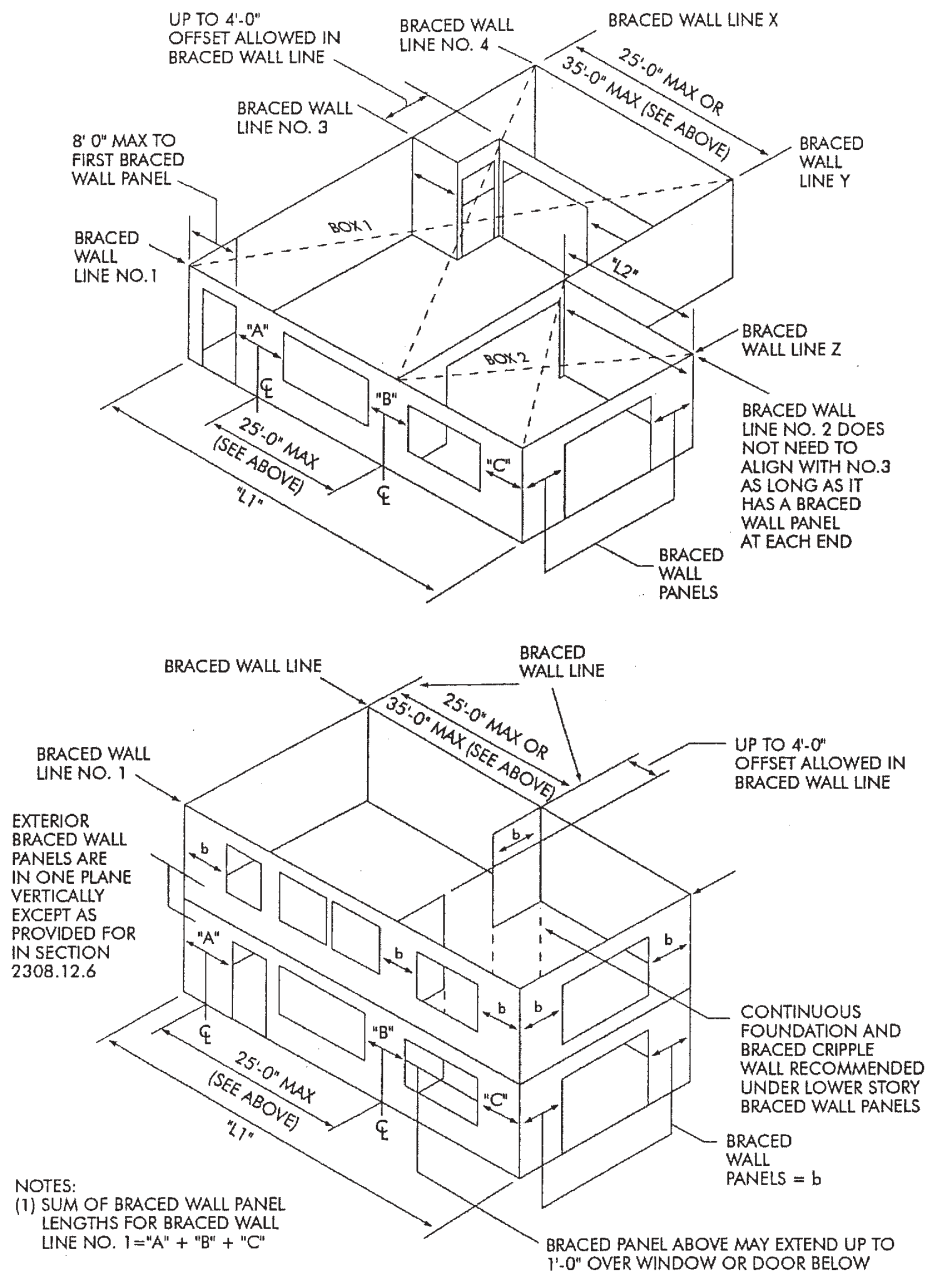
Interior Braced Wall Panels

R602.10.6-C

VOOD

Figure 9

SEISMIC DESIGN CATEGORY	MAXIMUM WALL SPACING (feet)	REQUIRED BRACING LENGTH, b
A, B, and C	35'-0"	Table 2308.9.3(1) and Section 2308.9.3
D and E	25'-0"	Table 2308.12.4



SI: 1 ft = 304.8 mm

FIGURE 2308.9.3  
BASIC COMPONENTS OF THE LATERAL BRACING SYSTEM

## Prescriptive Wall Bracing Example:

Category D1 ( $S_s \leq 1.25g$ and $S_d \leq 0.83g$ ) or less than 110 mph	One story	Methods 2, 3, 4, 5, 6, 7 or 8	Located at each end and at least every 25 feet on center but not less than 20% of braced wall line for Method 3 and 30% of braced wall line for methods 2, 4, 5, 6, 7 or 8.
	Top of two or three story		
	First story of two story Second story of three story	Methods 2, 3, 4, 5 ,6, 7 or 8	Located at each end and not more than 25 feet on center but not less than 45% of braced wall line for Method 3 and 60% of braced wall line for Methods 2, 4, 5, 6, 7 or 8.
	First story of three story	Methods 2, 3, 4, 5, 6, 7 or 8	Located at each end and not more than 25 feet on center but not less than 60% of braced wall line for Method 3 and 85% of braced wall line for Method 2, 4, 5, 6, 7 or 8.

Refer to Figure 9 on page 76:

One Story house (top figure)

60 Feet Wide (Noted as "L1")

20' "L2" for Box 2

40 Feet Deep

Bracing requirements:

**Side to Side**

Braced Wall Line No. 1

$L = 60'$  Method 3 – Plywood Bracing (20% of wall length)

Bracing required per Table R602.10.1

$60' \times 20\% = 12'$  total of wall bracing

Therefore (3) 4' typical braced wall panels required

Bracing requires 25' maximum spacing

On Figure 9, (top figure) wall panels "A", "B", "C" as shown, each 4' in length meet the requirement

Braced Wall Line No. 2

$L = 20'$  Method 3 – Plywood Bracing (20% of wall length)

Bracing required:

$20' \times 20\% = 4'$ , however need brace at each end

Therefore (2) 4' typical braced wall panels required

Braced Wall Line No. 3

$L = 40'$  Method 5 – Gypsum Wall board (30% of wall line for this method per table R602.10.1)

Bracing required

$40' \times 30\% = 12'$

Gypsum wall panels are minimum 96" if one sided, or 48" if sheathed on both sides.

Braced wall panels at each end

Note the 4' foot offset is allowed in braced wall line

Braced Wall Line No. 4

$L = 40'$  Method 3 – Plywood Bracing (20 % of wall length)

**Bracing Required:**

$$40' \times 20\% = 8'$$

However, maximum spacing is 25' on center, therefore would require (3) braced wall panels

**Front to Rear****Braced Wall Lines X & Y**

$$L = 40' \text{ Method 3 – Plywood bracing}$$

**Bracing required:**

$$40' \times 20\% = 8' \text{ total of wall bracing}$$

However, braced wall panels must also be a maximum of 25' on center spacing

Therefore (3) 4' typical brace wall panels required

**Braced Wall Line Z**

$$L = 20' \text{ Method 3 – Plywood Bracing}$$

$$20' \times 20\% = 4', \text{ however, need brace wall panel at each end of wall line}$$

Therefore (2) 4' typical braced wall panels required

**Two Story house (bottom figure)**

60 Feet Wide (Noted as "L1")

25 Feet Deep (For this example)

**Top Story Bracing****Side to Side****Braced Wall Line No. 1 (Front)**

$$L = 60' \text{ Method 3 – Plywood Bracing}$$

**Bracing required per Table R602.10.1**

$$60' \times 20\% = 12' \text{ total of wall bracing}$$

Therefore (3) 4' typical braced wall panels required

Bracing requires 25' maximum spacing

On Figure 9, wall panels "b", "b", "b" as shown, each 4' in length meet the requirement

**Front to Rear****Braced wall at the end**

$$L = 25' \text{ Method 3 – Plywood Bracing (20\% of wall length)}$$

**Bracing required per Table R602.10.1**

$$25' \times 20\% = 5' \text{ total of wall bracing, however, need brace at each end}$$

Therefore (2) 4' typical braced wall panels required

**Brace wall line in the center**

$$L = 25' \text{ Method 5 – Gypsum Wall Board (30\% of wall length)}$$

$$25' \times 30\% = 7.5'$$

Therefore (1) 4' double sided gypsum wall board panel at each end of the wall line

**Bottom Story Bracing****Side to Side****Braced wall line No. 1 (Front)**

$$L = 60' \text{ Method 3 – Plywood Bracing (45\% of wall length)}$$

Bracing required per Table R602.10.1

$60' \times 45\% = 27'$  total of bracing

Therefore "A" + "B" + "C" must be at least 27' and be constructed as Braced Wall Panels

A 32" alternate braced wall panel (refer to Figure 12) is permitted to replace 4' of braced wall section. Also, the maximum spacing of brace wall panels is 25' on center

In this layout the plan must always have a braced panel at each end of the wall line. This first braced wall panel can begin up to 8' maximum from the end provided that it either has a 24" at the corner and attached per Figure 13, or has an 1800 lb hold down

If the house plan cannot meet these prescriptive bracing requirements, then engineering will be required

### **Front to Rear**

Braced wall line at the end

$L = 25'$  Method 3 – Plywood Bracing (45% of wall length)

Bracing required per Table R602.10.1

$25' \times 45\% = 11.25'$  total of bracing

Therefore b + b must be at least 11'-3"

Brace wall line at the center

$L = 25'$  Method 5 – Gypsum Wall board (60% of wall length)

Bracing required per Table R602.10.1

$25' \times 60\% = 15'$  total of bracing

Therefore b + b must be at least 15'

Because the plan is greater than 50' in width, these interior braced panels must also be supported by continuous footings per R403.1.2. Refer to Figure 14 (on page 75) for continuous load path

## Section Five: Life-Safety Provisions

Presented by Vern Perry, MK Lawler, David Maret, and Wayne Folkers

### Location on lot

#### Section 302

- **Exterior walls** with a fire separation distance less than 3' shall have not less than one-hour fire-resistive rating with exposure from both sides. Projections shall not extend to a point closer than 2' from the line used to determine the fire separation distance.
  - **Exception:** Detached garages accessory to a dwelling located within 2' of a lot line may have roof eave projections not exceeding 4".
- **Projections** extending into the fire separation distance shall have not less than 1 hour fire-resistive construction on the underside. The above provisions shall not apply to walls which are perpendicular to the line used to determine the fire separation distance.
- **Openings** shall not be permitted in the exterior wall of a dwelling or accessory building with a fire separation distance less than 3'. This distance shall be measured perpendicular to the line used to determine the fire separation distance.
  - **Exceptions:** Openings shall be permitted in walls that are perpendicular to the line used to determine the fire separation distance.
  - Foundation vents installed in compliance with this code are permitted.

#### Section 317

- Each townhouse (**Zero Lot Line Dwelling**) shall be considered a separate building and shall be separated by fire-resistance-rated wall assemblies meeting the requirements of Section R302 for exterior walls.
  - **Exceptions:** A common 2-hour fire-resistance-rated wall is permitted for townhouses if such walls do not contain plumbing or mechanical equipment, ducts or vents in the cavity of common wall.
- **Continuity:** The common wall for townhouses shall be continuous from the foundation to the underside of the roof sheathing, deck or slab and shall extend the full length of the common wall including walls extending through and separating attached accessory structures.
- **Parapets** shall be provided for townhouses as an extension of common exterior walls in accordance with the following:
  - Where roof surfaces adjacent to the walls at the same elevation, the parapet shall extend not less than 30" above the roof surfaces.
  - Where roof surfaces adjacent to the wall at different elevations and the higher roof is not more than 30" above the lower roof, the parapet shall extend not less than 30" above the lower roof surface.
  - **Exception:** A parapet is not required in the two cases above when the roof is covered with a minimum class "C" roof covering, and the roof decking or sheathing is of noncombustible materials or approved fire-retardant-treated wood for a distance of 4' on each side of the walls, one layer of 5/8" Type X gypsum board is installed directly beneath the roof decking or sheathing for a distance 4' on each side of the walls.
  - A parapet is not required where roof surfaces adjacent to the walls are at different elevations and the higher roof is more than 30" above the lower roof. The common



wall construction from the lower roof to underside of the higher roof deck shall not have less than a 1-hour fire-resistive rating. The walls shall be rated for exposure from both sides.

## Dwelling Unit Separation

- **Two-family dwellings:** Dwelling units in two-family dwellings shall be separated from each other by wall and /or floor assemblies having not less than one-hour fire-resistance-rating. Fire-resistance-rated floor-ceiling and wall assemblies shall extend to and be tight against the exterior wall, and wall assemblies shall extend to the underside of roof sheathing.
  - **Exception:** A fire-resistance-rating of ½ hour shall be permitted in buildings equipped throughout with an automatic sprinkler system installed in accordance with FRPA 13.
- **Supporting Construction:** When floor assemblies are required to be fire-resistance-rated, the supporting construction of such assemblies shall have an equal or greater fire-resistive-rating.

## Fire Separation Requirements for Attached or Detached Buildings on a Residential Lot

No separation is required between residential structures. Residential structures with less than 6 feet between them, if not protected from the assumed property line as required by code, and with a combined square footage of 3600 square feet or more, requires a Fire Marshal review. Detached or attached garages separated less than 6 feet, shall be protected from any residential wall not perpendicular to the garage wall by not less than ½ inch gypsum wallboard applied to the garage side. Habitable rooms above shall be separated by not less than 5/8 inch type x gypsum wall board. Where the separation is a floor-ceiling assembly the walls supporting the separation shall be protected on the garage side by not less than 1/2 inch gypsum wallboard. Openings other than doors are not allowed with separation distance less than 6 feet. Openings for doors in walls not perpendicular, with less than 6 foot of separation distance, shall be protected by a solid wood door not less than 1 3/8 inch in thickness, solid or honeycomb steel doors not less than 1 3/8 inches thick, or 20-minute fire-rated doors. Garages from 1,000 square feet to 3,000 square feet require an 8 foot fire separation distance between the garage and residence.

Attached enclosed breezeways shall be protected on the garage side with not less than ½ inch gypsum wall board, sealing off the enclosed area in line with the garage wall. Open breezeways with no concealed spaces need not be protected. Carports not open on at least two sides shall be considered garages and shall comply with the provisions for garages.

A residential garage is limited to 3,000 sq ft which is classified as a U occupancy by the building code. When the garage is over 3,000 sq ft it must be classified as a different occupancy and meet the commercial fire flow requirements per the Fire Code. A garage can be divided into areas less than 3,000 sq ft by installing two hour fire walls and be considered a separate buildings.

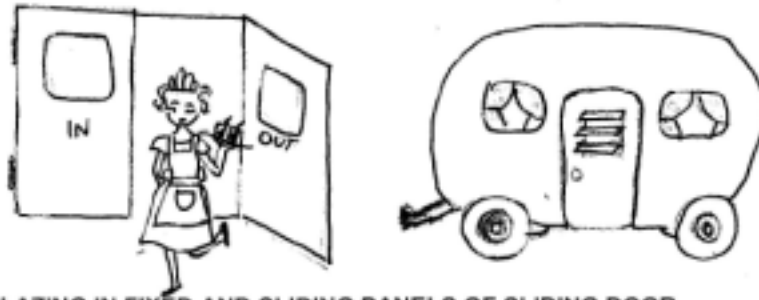
Fire separation distance (distance from structure to property line) for a garage of 1,000 sq ft or less is 3 feet. Garages of 1,000 sq ft to 3,000 sq ft require a 5 foot separation distance.

Fire separation distance for a residence is 3 feet.

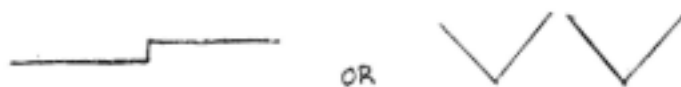
## Glazing

### 1.) GLAZING IN SWINGING DOORS

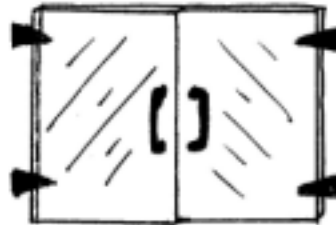
- a. Exception: Jalousies; windows with moveable horizontal glass slats angled to admit ventilation and keep out rain.



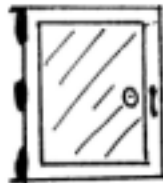
### 2.) GLAZING IN FIXED AND SLIDING PANELS OF SLIDING DOOR ASSEMBLIES AND PANELS IN SLIDING AND BI-FOLD CLOSET DOOR ASSEMBLIES.



### 3.) GLAZING IN STORM DOORS



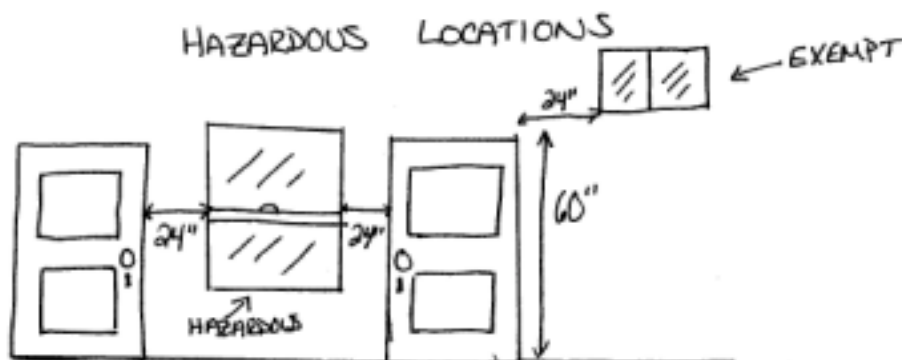
### 4.) GLAZING IN UNFRAMED SWING DOORS



- 5.) GLAZING IN DOORS AND ENCLOSURES FOR HOT TUBS, WHIRLPOOLS, SAUNAS, STEAM ROOMS, BATHTUBS AND SHOWERS. GLAZING IN ANY PORTION OF A BUILDING WALL ENCLSOING THESE COMPARTMENTS WHERE THE BOTTOM EXPOSED EDGE OF THE GLAZING IS LESS THAN 60 INCHES ABOVE A STANDING SURFACE.



- 6.) GLAZING IN AN INDIVIDUAL FIXED OR OPERABLE PANEL ADJACENT TO A DOOR WHERE THE NEAREST EXPOSED EDGE OF THE GLAZING IS WITHIN A 24-INCH ARC OF EITHER VERTICAL EDGE OF THE DOOR IN A CLOSED POSITION AND WHERE THE BOTTOM EXPOSED EDGE OF THE GLAZING IS LESS THAN 60 INCHES ABOVE THE WALKING SURFACE.

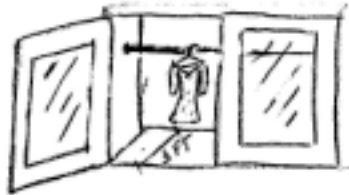


**Exceptions:**

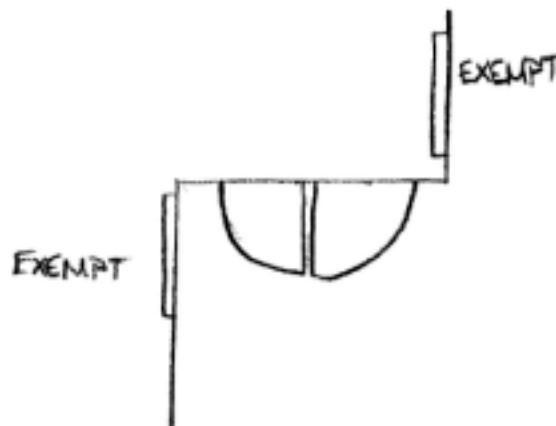
- a.) s where there is an intervening wall or other permanent barrier between the door and glazing



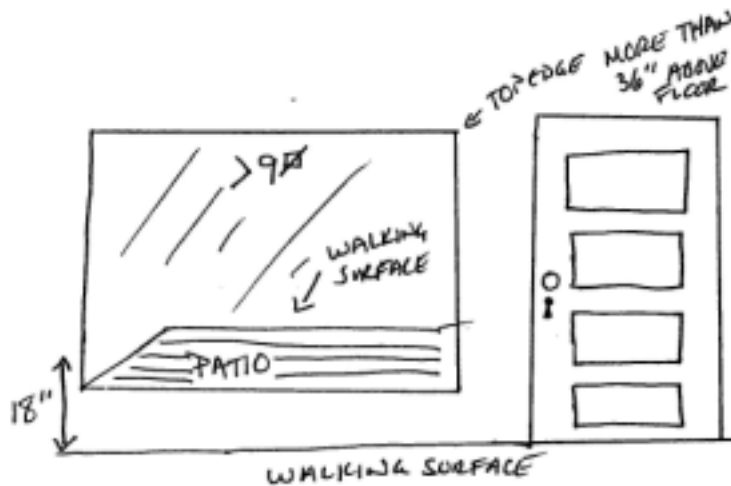
- b.) Where access through the door is to closet or storage area 3 feet or less in depth. Glazing in this application shall comply with Section 2406.3, Item 7.



- c.) Glazing in walls perpendicular to the plane of the door in a closed position, other than the wall towards which the door swings when opened, in one-and two-family dwellings or within dwelling units in Group R-2

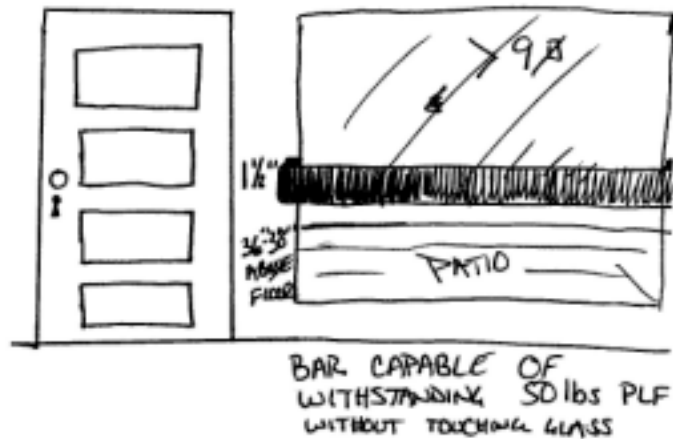


- 7.) Glazing in an individual fixed or operable panel, other than those locations described in preceding Items 5 and 6, which meets all of the following conditions:
- a.) Exposed area of an individual pane greater than 9 square feet;
  - b.) Exposed bottom edge less than 18 inches above the floor;
  - c.) Exposed top edge greater than 36 inches above the floor; and
  - d.) One or more walking surface(s) within 36 inches horizontally of the plane of the glazing

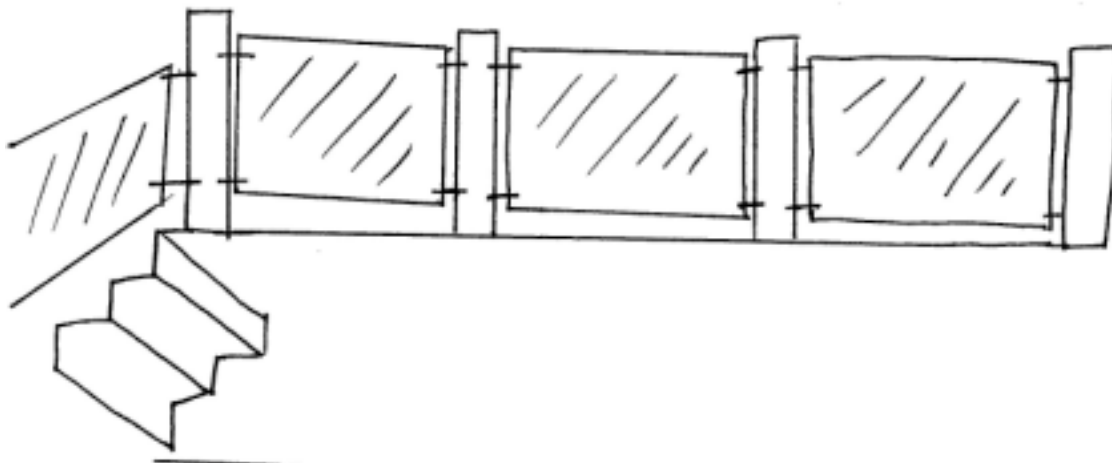


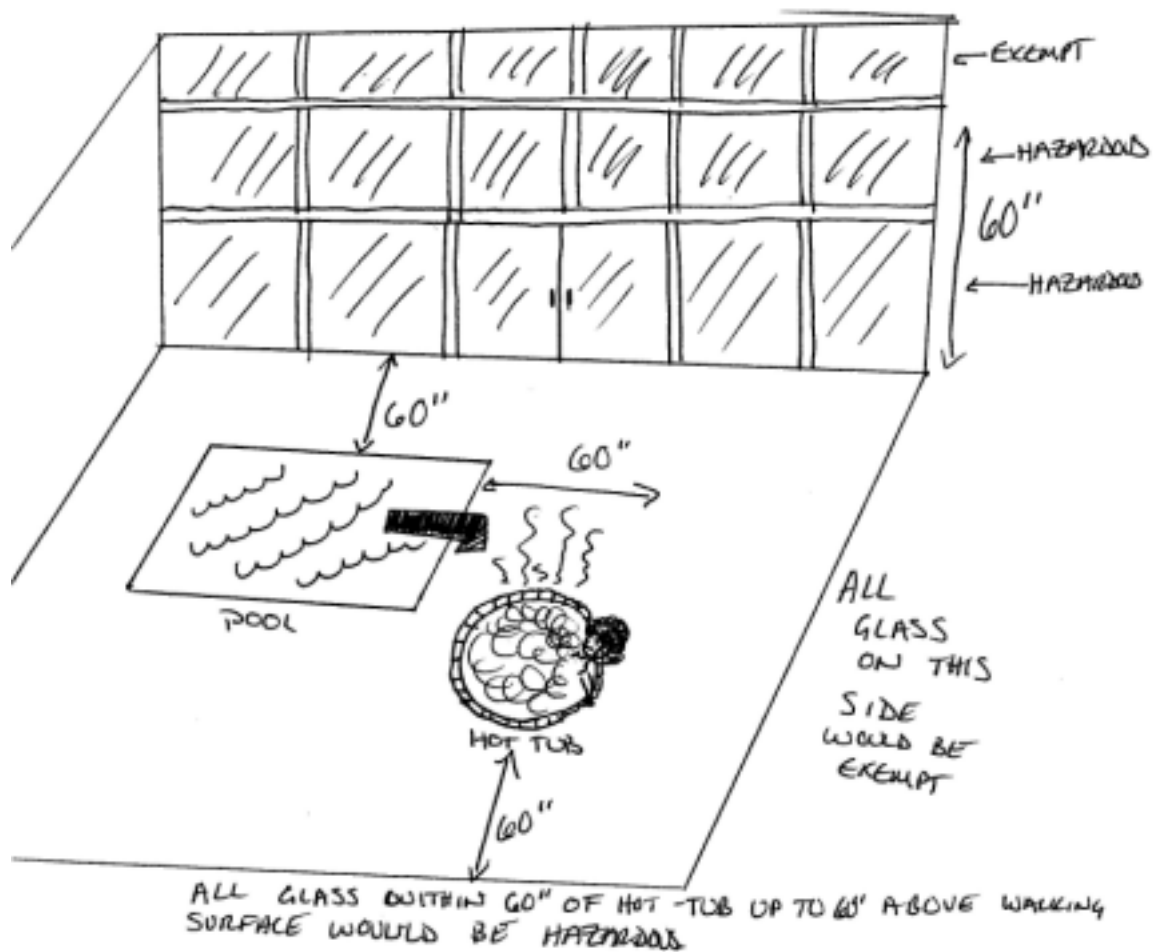
**EXCEPTION:** Safety glazing for Item 7 is not required for the following installations:

- a.) A protective bar 1-1/2 inches or more in height, capable of withstanding a horizontal load of 50 pounds plf without contacting the glass, is installed on the accessible sides of the glazing 34-38 inches to above the floor.
- b.) The outboard pane in insulating glass units or multiple glazing where the bottom exposed edge to the glass is 25 feet or more above any grade, roof walking surface or other horizontal or sloped surface adjacent to the glass exterior.



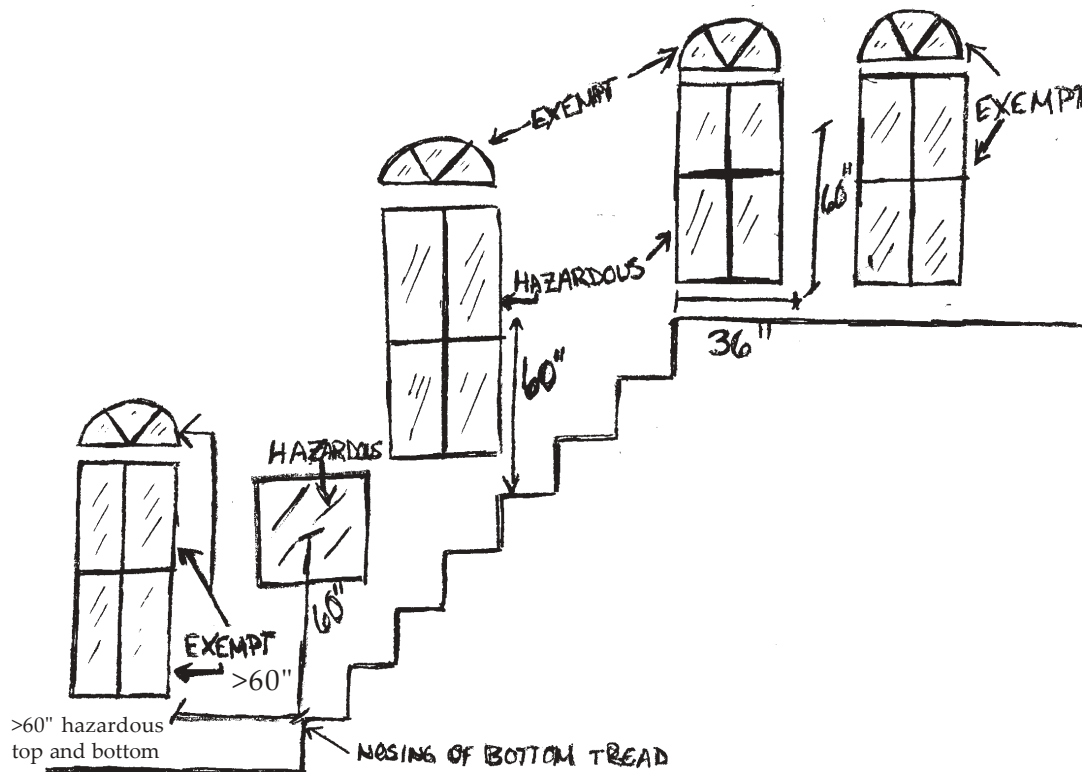
- 8.) GLAZING IN GUARDS AND RAILINGS, INCLUDING STRUCTURAL BALUSTER PANELS AND NONSTRUCTURAL IN-FILL PANELS, REGARDLESS OF AREA OR HEIGHT ABOVE A WALKING SURFACE





9.) GLAZING IN WALLS AND FENCES ENCLOSING INDOOR AND OUTDOOR SWIMMING POOLS, HOT TUBS AND SPAS WHERE ALL OF THE FOLLOWING CONDITIONS ARE PRESENT:

- The bottom edge of the glazing on the pool or spa side is less than 60 inches above a walking surface on the pool or spa side of the glazing; and
- The glazing is within 60 inches horizontally of the water's edge of a swimming pool or spa.



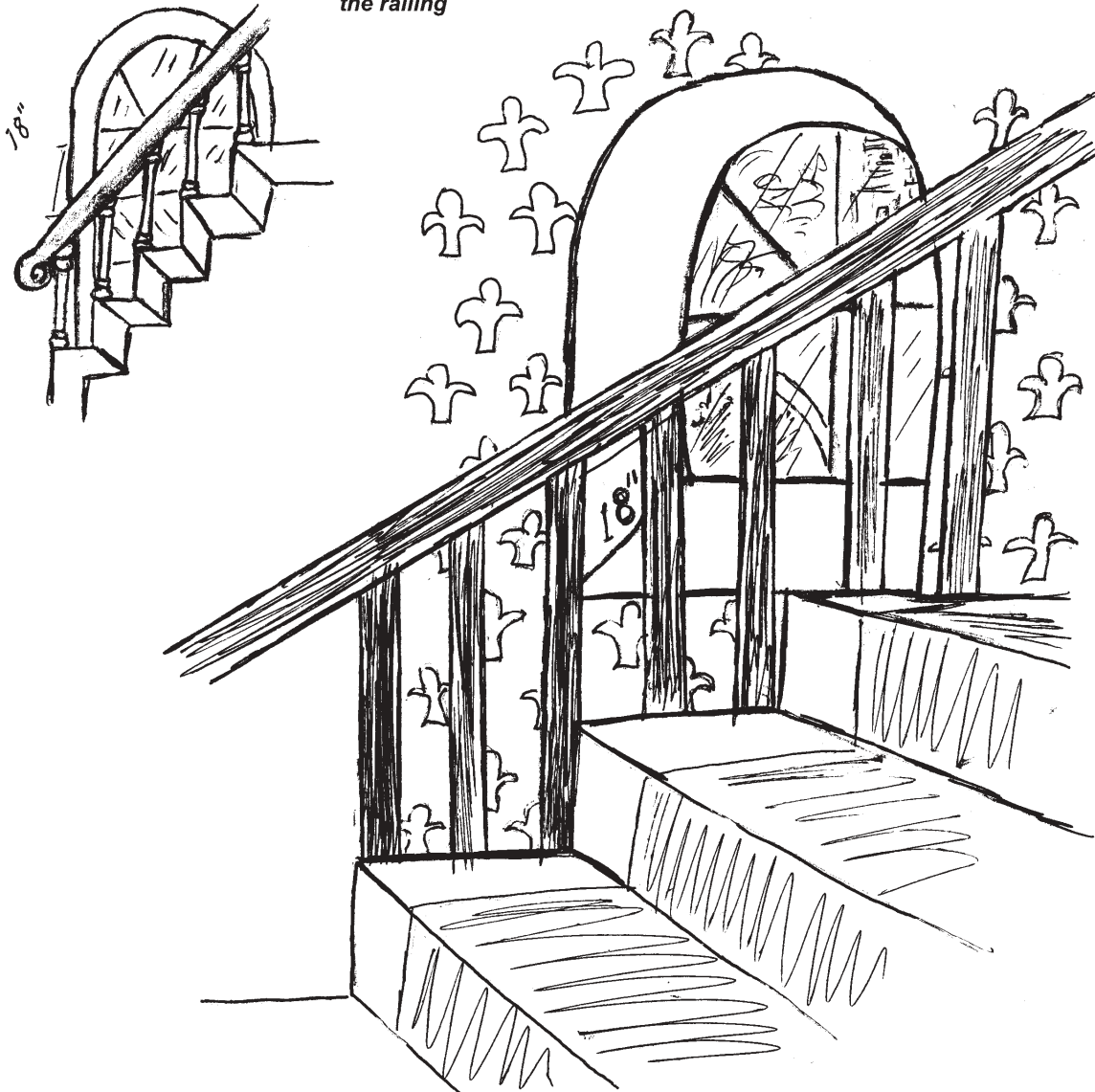
NTS

- 10.) GLAZING ADJACENT TO STAIRWAYS, LANDINGS AND RAMPS WITHIN 36 INCHES HORIZONTALLY OF A WALKING SURFACE; WHEN THE EXPOSED SURFACE OF THE GLASS IS LESS THAN 60 INCHES ABOVE THE PLANE OF THE ADJACENT WALKING SURFACE.
- 11.) GLAZING ADJACENT TO STAIRWAYS WITHIN 60 INCHES HORIZONTALLY OF THE BOTTOM TREAD OF A STAIRWAY IN ANY DIRECTION WHEN THE EXPOSED SURFACE OF THE GLASS IS LESS THAN 60 INCHES ABOVE THE NOSE OF THE TREAD.



**EXCEPTION:** Safety glazing for item 10 or 11 is not required for the following installations where:

- a.) The side of a stairway, landing or ramp which has a guardrail or handrail, including balusters or in fill panels, complying with the provisions of Sections 1012 and 1607.7; and
- b.) The plane of the glass is greater than 18 inches from the railing



## Light, Ventilation, and Heating

All habitable rooms shall have 8% aggregate glazing of the floor area. (Section R303.1)

Natural ventilation shall be provided at one-half the area of glazing or 4% and shall be openable. (Section R303.1)

**Exception:** Mechanical ventilation can be used, if egress windows are not required, but shall comply with Washington State Ventilation Code (WSEC), Chapter 3.

Types of ventilation per the WSEC are: source specific, whole house, and intermittently operated whole house.

### Minimum Room Areas

At least one habitable room shall be 120sq.ft. minimum. (Section R304.1)

Other habitable rooms shall be 70sq.ft minimum. (Section R304.2)

The horizontal dimension shall not be less than 7 feet. (any direction) (Section R304.3)

Rooms with sloped ceiling less than 5 feet or furred less than 7 feet above the floor shall not count as habitable area. (Section R304.4)

### Ceiling Height

Ceilings shall have a minimum height of 7 feet.

#### Exceptions:

- Beams and girder not less than 4ft. on-center may project 6 inches below the ceiling height.
- Basements without habitable spaces may project to within 6'8" and beams, girders, ducts and other projections may project to within 6'4".
- Rooms with sloped ceiling shall have not more than 50% less than 5 feet in height.
- Bathrooms shall have a ceiling height of 6'8" over fixtures at the front clearance area. (Section R305)

**Note:** Sanitation, toilets, and shower spaces are regulated by the 2003 Uniform Plumbing Code.

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## Emergency Escape Windows

- Basements with habitable spaces and every sleeping room shall have one emergency escape window. (R310.1)
- Sill height shall be not more than 44 inches above finished floor. (R310.1)
- Where a door opening having a threshold below adjacent grade elevation serves as an emergency escape and rescue opening and is provided with a bulkhead enclosure, the enclosure shall comply with Section (R310.3). (R310.1)
- Minimum net egress opening shall be 5.7sq.ft. (R310.1)
- *Exception:* Grade floor openings shall have a minimum net clear opening of 5sq.ft. (R310.1.1)
- Definition of Grade Floor Opening: a window or other opening located such that the sill height is not more than 44 inches above or below the finished ground level adjacent to the opening.
- Emergency escape windows shall be operational without keys or tools (R310.1.4)

### Window Wells

- The minimum horizontal area of the well shall be 9sq.ft. (36x36) (R310.2)
- The area of the well shall allow full opening of the escape window (R310.2)
- Wells with a vertical depth greater than 44 inches shall be equipped with a ladder.

### Bulkhead Enclosures

- Enclosures shall provide direct access to the basement. (R310.3)
- Enclosures with door panels in the fully open position shall be not less than 5.7sq.ft.
- Enclosures **not** part of the building egress shall comply with R311.5.8.2.

### Bars, Grills, Covers and Screens

Bars, grills, covers and screens are permitted over escape openings, provided the minimum net clear opening is provided and the device shall be releasable or removable from the inside without the use of a key, tool or force greater than that which is required to open the escape opening. (R310.4)

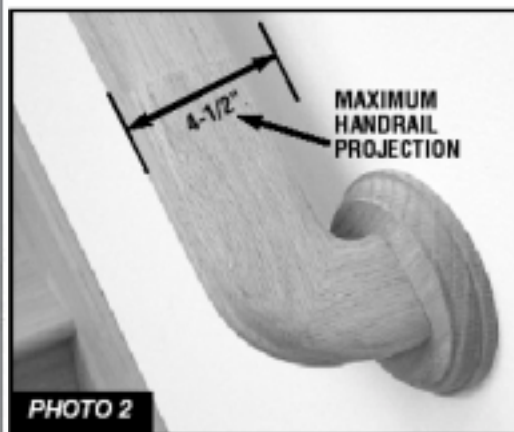
## Means of egress, stairs, landings, doors, and guards

- Required exterior exit balconies, stairs, and similar exit facilities shall be positively anchored to the primary structure. Such attachment **shall not** be accomplished by use of toenails or nails subject to withdrawal. (R311.2.1)
- Enclosed usable space under stairs shall be protected with ½-inch gypsum. (R311.2.2)
- Exit doors shall be side hinged. (R311.4.1)
- Landings shall be provided on both sides of each exterior door.
- *Exception:* at other than the **required** exit door a stairway of two or fewer risers is permitted on the exterior side of the door.
- Landings at the required exit door shall not be more than 1.5 inches below the top of the threshold. (R311.4.3)
- All other exterior door shall have a landing not more than 7 ¾ inches below the top of the threshold. (R311.4.3)

## Stairs, Section R 311.5

### Width

Stairways shall not be less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required headroom height. **PHOTO 1.** Handrails shall not project more than 4.5 inches (114 mm) on either side of the stairway **PHOTO 2.** and the minimum clear width of the stairway at and below the handrail height, including treads and landings, shall not be less than 31.5 inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are provided on both sides. **PHOTO 3.** *Exception:* The width of spiral stairways shall be in accordance with Section 311.5.8.1.



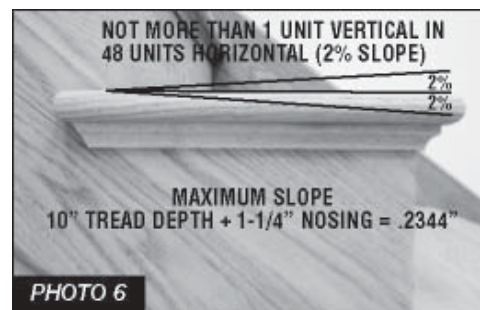
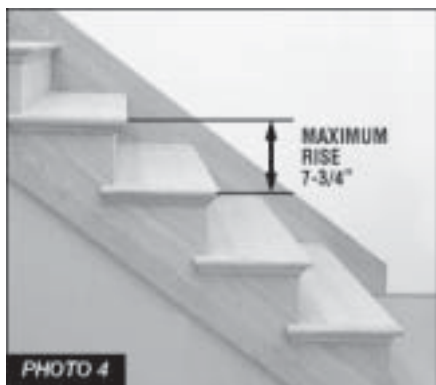
### 311.5.2 Headroom

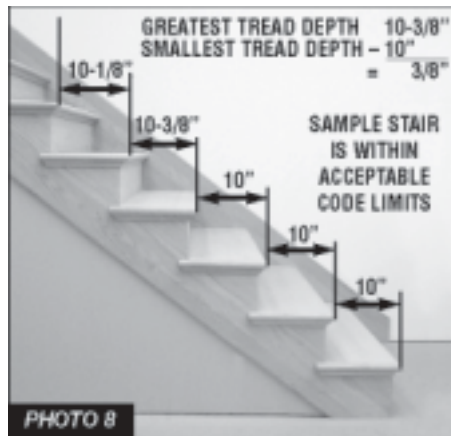
The minimum headroom in all parts of the stairway shall not be less than 6 feet, 8 inches (2032 mm) measured vertically from the sloped plane adjoining the tread nosing, **PHOTO 15**, or from the floor surface of the landing or platform. **PHOTO 16**.



### R 311.5.3 Treads and risers

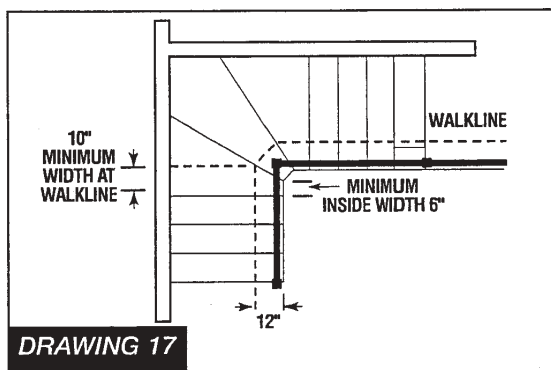
The maximum riser height shall be 7-3/4 inches (196 mm) and the minimum tread depth shall be 10 inches (254 mm). The riser height shall be measured vertically between leading edges of the adjacent treads. **PHOTO 4**. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. **PHOTO 5**. The walking surface of treads and landings of a stairway shall be sloped no steeper than one unit vertical in 48 units horizontal (2 percent slope). **PHOTO 6**. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). **PHOTO 7**. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). **PHOTO 8**.



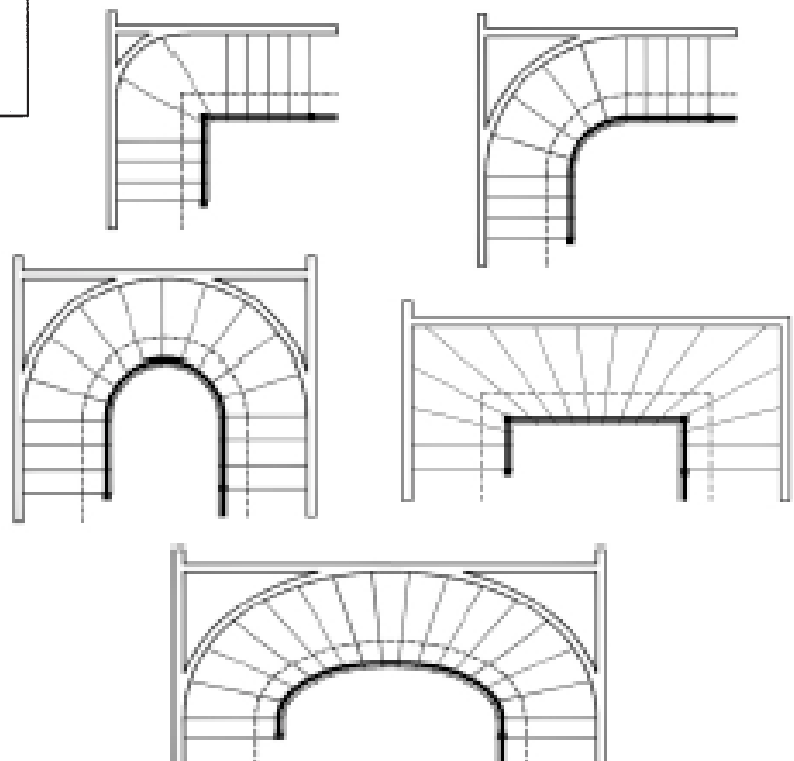


### 311.5.3.2 Winders.

Winders are permitted, provided that the width of the tread at a point not more than 12 inches (305 mm) from the side where the treads are narrower is not less than 10 inches (254 mm) and the minimum width of any tread is not less than 6 inches (152 mm). The continuous handrail required by Section R315.1 shall be located on the side where the tread is narrower. **DRAWING 17.**



Alternate Winder designs

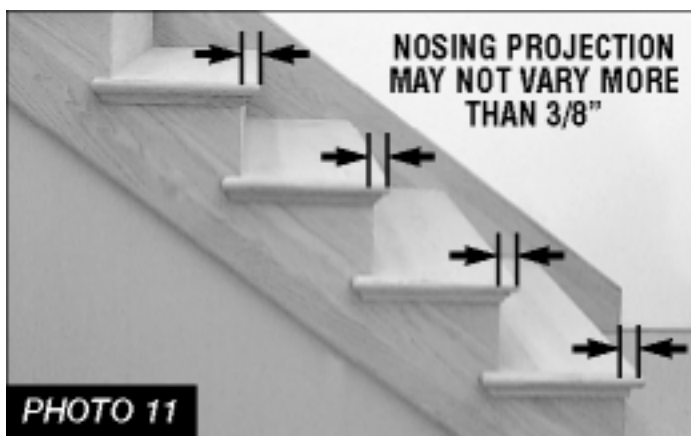
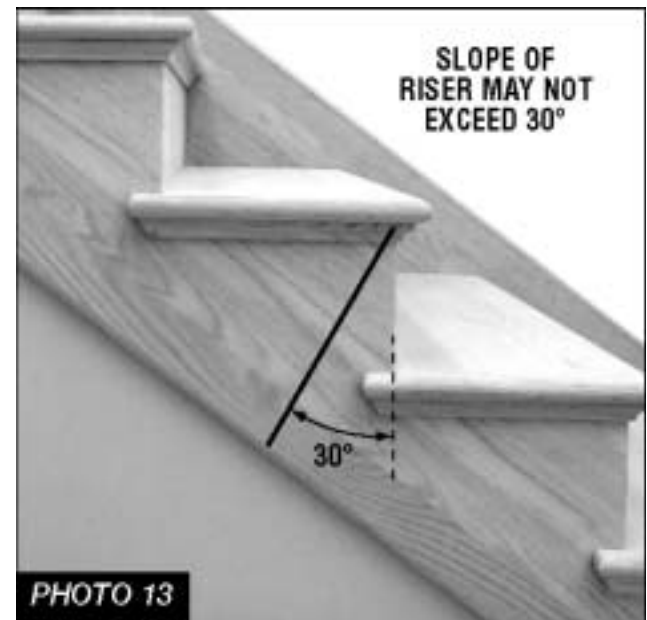
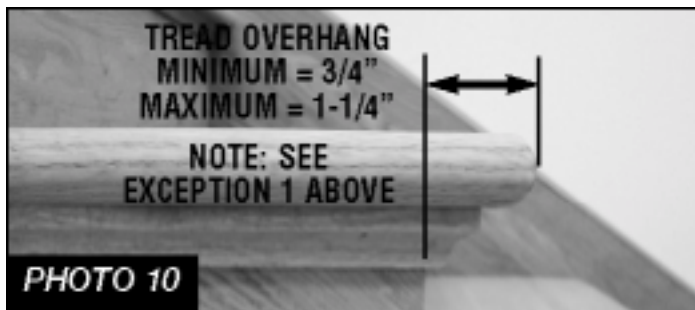
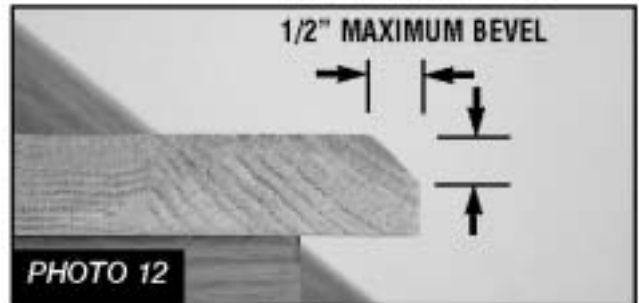
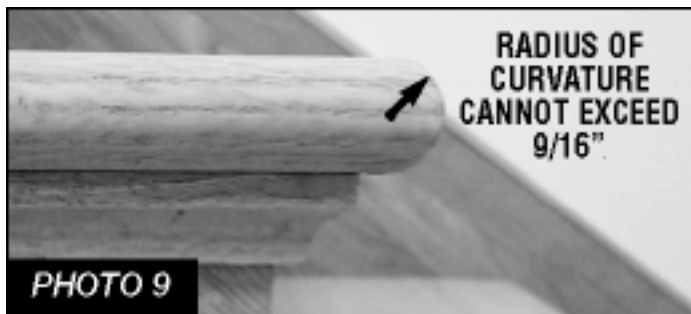




### R311.5.3.3 Profile

The radius of curvature at the leading edge of the tread shall be no greater than 9/16 inch (14.3 mm). **PHOTO 9.** A nosing not less than 3/4 inch (19.1 mm) but not more than 1-1/4 inches (32 mm) shall be provided on stairways with solid risers. **PHOTO 10.** The greatest nosing projection shall not exceed the smallest nosing projection by more than 3/8 inch (9.5 mm) between two stories, including the nosing at the level of floors and landings. **PHOTO 11.** Beveling of nosing shall not exceed 1/2 inch (12.7 mm). **PHOTO 12.** Risers shall be vertical or sloped from the underside of the leading edge of the tread above at an angle not more than 30 degrees from the vertical. **PHOTO 13.** Open risers are permitted, provided that the opening between treads does not permit the passage of a 4-inch-diameter (102 mm) sphere. **PHOTO 14.**

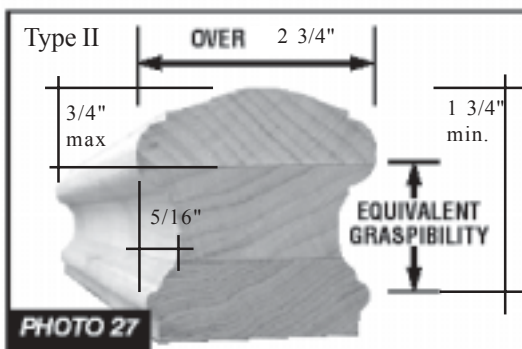
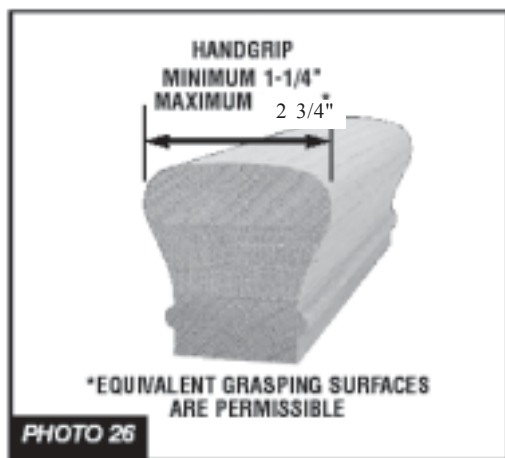
- Exceptions:**
1. A nosing is not required where the tread depth is a minimum of 11 inches (279 mm).
  2. The opening between adjacent treads is not limited on stairs with a total rise of 30 inches (762 mm) or less.





### 311.5.6.3 Handrail grip size

The handgrip portion of handrails shall have a circular cross section of 1-1/4 inches (32 mm) minimum to 2-5/8 inches (67 mm) maximum. **PHOTO 26.** Other handrail shapes that provide an equivalent grasping surface are permissible. **PHOTO 27.** Edges shall have a minimum radius of 1/8 inch (3.2 mm). **PHOTO 28**

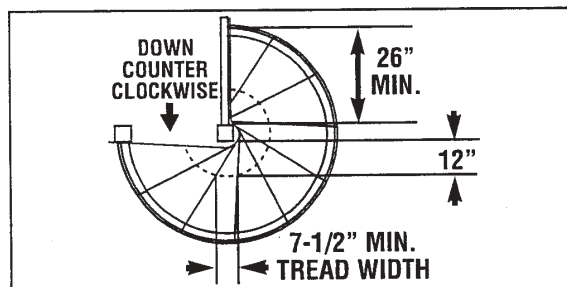
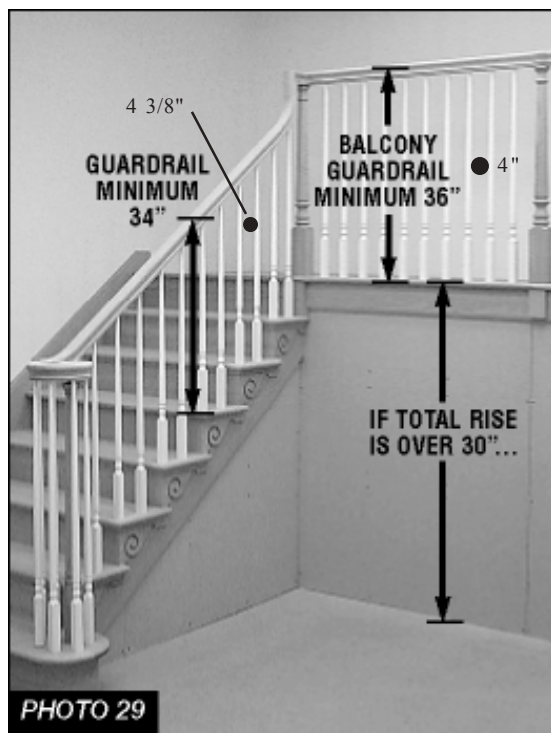




## GUARDS

### 312 Guards required

Porches, balconies or raised floor surfaces located more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 36 inches (914 mm) in height. Open sides of stairs with a total rise of more than 30 inches (762 mm) above the floor or grade below shall have guards not less than 34 inches (864 mm) in height measured vertically from the nosing of the treads. **PHOTO 29.**

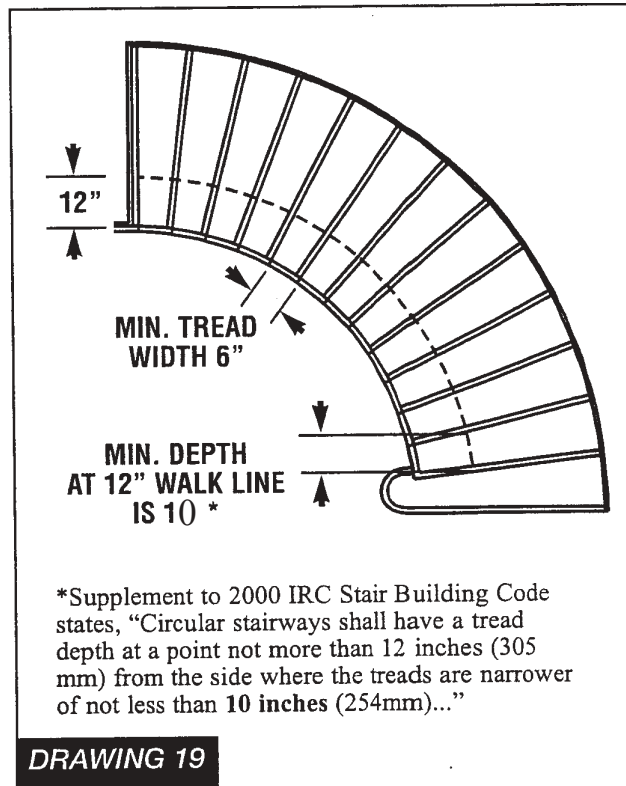


### R311.5.8 Spiral Stairs

Spiral stairways are permitted, provided the minimum width shall be 26 inches (660 mm) with each tread having a 7-1/2 inch (190 mm) minimum tread width at 12 inches (305 mm) from the narrow edge. All treads shall be identical, and the rise shall be no more than 9-1/2 inches (241 mm). A minimum headroom of 6 feet, 6 inches (1982 mm) shall be provided. **PHOTO 18.**

### 311.5 Circular Stairways

Circular stairways shall have a tread depth at a point not more than 12 inches (305 mm) from the side where the treads are narrower of not less than 10 inches (253 mm) and the minimum depth of any tread shall not be less than 6 inches (152 mm). Tread depth at any walking line, measured a consistent distance from a side of the stairway, shall be uniform. **DRAWING 19.**



#### 311.5.7 Illumination

All stairs shall be provided with illumination in accordance with Section R303.6. One foot candle at center of treads and landings.

#### 311.2.2 Under stair protection

Enclosed accessible space under stairs shall have walls, under stair surface and any soffits protected on the enclosed side with 1/2" (12.7-mm) gypsum board.

#### 311.5.8.2 Bulkhead enclosure stairways

Stairways serving bulkhead enclosures not part of the required building egress and providing access from the outside grade level to the basement shall be exempt from the requirements of Sections R312, R314 and R315 when the maximum height from the basement finished floor level to grade adjacent to the stairway is covered by a bulkhead enclosure with hinged doors or other approved means.

**R316.2 Guard opening limitations**

Required guards on open sides of stairways, raised floor areas, balconies and porches shall have intermediate rails or ornamental closures which do not allow passage of a sphere 4 inches (102 mm) in diameter. **PHOTO 30.**

**Exception:** The triangular openings formed by the riser, tread and bottom rail of a guard at the open side of a stairway are permitted to be of such a size that a sphere 6 inches (152 mm) cannot pass through. **PHOTO 32.**

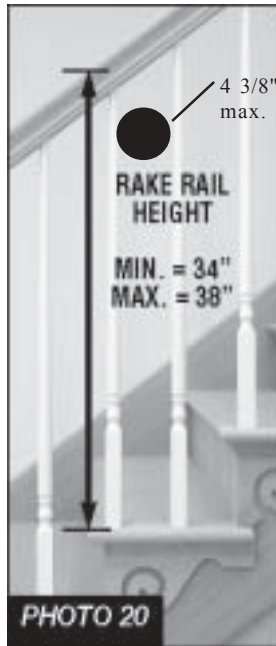


## HANDRAILS

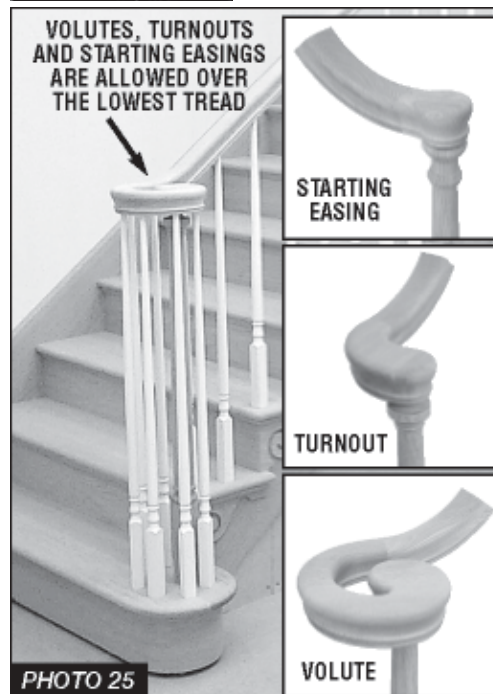
### 311.5.6.3 Handrails

Handrails having minimum and maximum heights of 34 inches and 38 inches (864 mm and 965 mm), respectively, measured vertically from the nosing of the treads, shall be provided on at least one side of stairways. **PHOTO 20.** All required handrails shall be continuous the full length of the stairs with two or more risers from a point directly above the top riser of a flight to a point directly above the lowest riser of the flight. **PHOTO 21.** Ends shall be returned or shall terminate in newel posts or safety terminals. **PHOTO 22.** Handrails adjacent to a wall shall have a space of not less than 1.5 inches (38 mm) between the wall and the handrail. **PHOTO 23.**

- Exceptions:**
1. Handrails shall be permitted to be interrupted by a newel post at a turn. **PHOTO 24.**
  2. The use of a volute, turnout or starting easing shall be allowed over the lowest tread. **PHOTO 25.**



Handrail may be interrupted by a newel



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## Smoke Alarms

- Alarms shall be clearly audible in all bedrooms over back-ground noise levels with the doors closed. (R313.1)
- When interior alteration, repairs, or additions require a permit smoke alarms shall be installed. (R313.1.1)
- Alarms in existing area are not required to be interconnected and hard wired where repairs or alteration do not result in removal of interior wall or ceiling finishes, **unless** there is an attic, crawl space or basement available which could provide access for hard wiring and interconnection without removal on interior finishes. (R313.1.1)

## Section Six: Energy Code

Presented by John Weber

### Prescriptive Approach – Simple Form For the Washington State Energy Code (2001 Second Edition) Climate Zone 1

#### Site Information

Lot: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_  
 State: \_\_\_\_\_ Zip: \_\_\_\_\_  
 Contact: \_\_\_\_\_  
 Phone: \_\_\_\_\_  
 Phone 2: \_\_\_\_\_  
 Fax: \_\_\_\_\_

#### Building Department Use Only

Permit #: \_\_\_\_\_  
 Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Table 6-1**  
**PRESCRIPTIVE REQUIREMENTS <sup>6,1</sup> FOR GROUP R-3 OCCUPANCY**  
**CLIMATE ZONE 1**  
 (Unlimited Glazing Option Only)

Option	Glazing Area <sup>10</sup> % of Floor	Glazing U-Factor		Door <sup>9</sup> U-factor	Ceiling <sup>2</sup>	Vaulted Ceiling <sup>3</sup>	Wall Above Grade	Wall Int <sup>4</sup> Below Grade	Wall Ext <sup>4</sup> Below Grade	Floor <sup>5</sup>	Slab <sup>4</sup> On Grade
		Vertical	Overhead <sup>11</sup>								
IV.	Unlimited Group R-3 Occupancy Only	0.40	0.58	0.20	R-38	R-30	R-21	R-21	R-10	R-30	R-10

See the code text for footnote references

#### This project complies with the following:

- ✓ The project is a single family residence or duplex.
- ✓ The project is wood frame OR all of the insulation is interior or exterior of the framing.
- ✓ All building components meet the requirements listed in Table 6-1, Option IV.
- ✓ The project will meet all other provisions of the WSEC and VIAQ.

#### The project will take advantage of the following exceptions to the prescriptive option:

- ☐ 602.6 Exception 1. One door, that is 24 ft.<sup>2</sup> or less, that does not meet the standards is allowed.

Location of the door taking this exception \_\_\_\_\_

- ☐ 602.6 Exception 2. Doors with a U-factor of 0.40 allowed without calculations, Option IV only.

Location of the door(s) taking this exception \_\_\_\_\_

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## Component Performance Approach

### Calculations Required

If none of the prescriptive options are suitable for your house design, you may be able to show compliance using the component performance approach. This process allows trading off the thermal efficiency of one component for another; for example, more attic insulation would allow for less wall insulation (see Figure 1.3.)

To calculate energy performance, you must determine each building components area and U-factor (default U-factors for common building practices are listed in Chapter 10 of the WSEC and summarized in Chapter 10 of this Guide). Multiply the U-factor for each component by the component area. That gives a component UA. Add component UAs to find overall UA for the proposed building.

[502.1]

The overall UA must be compared to a reference value based on WSEC specifications, found in WSEC Table 5-1. The overall reference UA is calculated by multiplying the component areas from the proposed design by prescribed U-factors from the Code. Glazing in the reference calculation is limited to 15 percent. The proposed overall UA must be less than or equal to the reference UA to show compliance.

To choose the correct target from WSEC Table 5-1, identify the Climate Zone and fuel type for the home.

For each zone, the only difference between the fuel types is the target wall U-factor.

The WSU Energy Program developed spread sheets that simplify the component performance calculations. They are discussed in more detail at the end of this chapter.



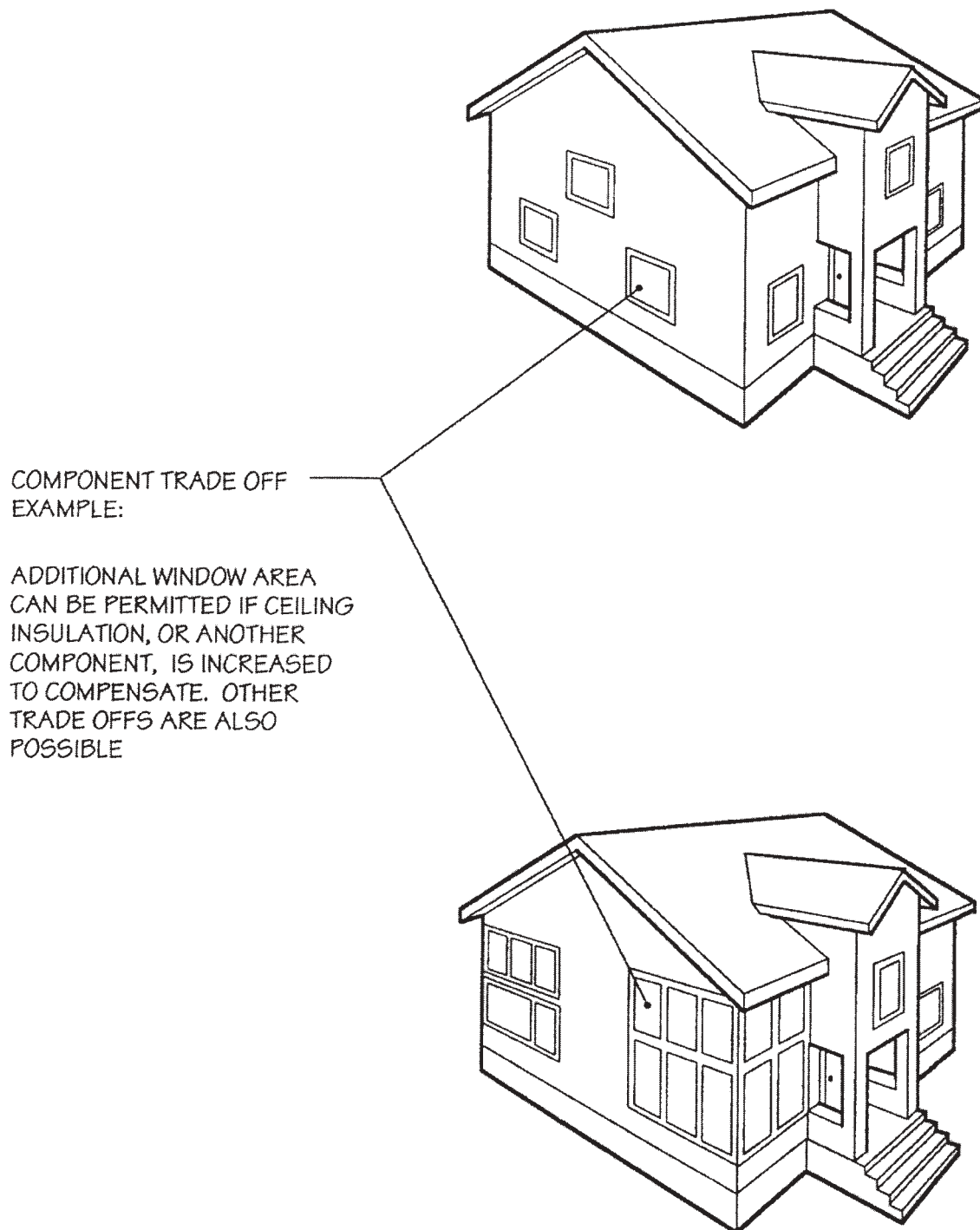
**Component Performance Approach**

Figure 1.2



**WSEC TABLE 5-1**  
**TARGET COMPONENT VALUES FOR GROUP R OCCUPANCY**

Component	Climate Zone	
	1	2
Glazing % Floor Area	15%	15%
Vertical Glazing U-Factor	U = 0.400	U = 0.400
Overhead Glazing U-Factor	U = 0.58	U = 0.58
Doors	U = 0.200 (R-5)	U = 0.200 (R-5)
Ceilings		
Attic	U = 0.031 (R-38)	U = 0.031 (R-38)
Single Rafter/Joist Vaulted	U = 0.034 (R-30)	U = 0.034 (R-30)
Walls		
Space Heat Type: Electric Resistance	U = 0.058 (R-19A)	U = 0.044 (R-19+5A)
Other	U = 0.062 <sup>1</sup> (R-19)	U = 0.062 <sup>1</sup> (R-19)
Floors	U = 0.029 (R-30)	U = 0.029 (R-30)
Slab on Grade	F = 0.54	F = 0.54
Slab R-Value	(R-10)	(R-10)
<b>Below Grade Interior</b>		
Wall R-Value	R-19	R-19
2' Depth: Walls	U = 0.043	U = 0.043
Slab	F = 0.69	F = 0.69
3.5' Depth: Walls	U = 0.041	U = 0.041
Slab	F = 0.64	F = 0.64
7' Depth: Walls	U = 0.037	U = 0.037
Slab	F = 0.57	F = 0.57
<b>Below Grade Exterior</b>		
Wall R-Value	R-10	R-12
2' Depth: Walls	U = 0.070	U = 0.061
Slab	F = 0.60	F = 0.60
3.5' Depth: Walls	U = 0.064	U = 0.057
Slab	F = 0.57	F = 0.57
7' Depth: Walls	U = 0.056	U = 0.050
Slab	F = 0.42	F = 0.42

1. Log and solid timber walls that have a minimum average thickness of 3.5" are exempt from wall target UA and proposed UA calculations [see page 1-10 for detail.]
2. "A" means advanced framing. For more information, see Section 1005.2.

## Systems Analysis

### Computer Simulation Recommended

The System Analysis Approach requires a calculation of the annual energy use of the proposed design. If the calculation demonstrates that the proposed design uses less heating energy than the Code defined home, it meets the envelope requirements of the Code.

The calculation must be done as described in Chapter 4 of the Code. It must account for local weather data, air infiltration, heating system efficiencies, solar gains, and internal gains including occupancy loads as well as the building shell insulation. The envelope requirements for the home are based on the component performance target UA. For other systems, refer to WSEC Chapter 4 (see Figure 1.5.)

[402.1.2]

When your design includes high efficiency heating equipment, or solar gain and thermal mass, systems analysis may allow trades between other components. The calculation is complex, however, and should be done using a computer program that is capable of documenting all of the building system interactions. This may require the help of a design professional.

WSEC Chapter 8 suggests software that may be used for systems analysis. Unfortunately, most of the information in Chapter 8 is out of date. The WSU Energy Program suggests that users interested in demonstrating compliance using the systems analysis approach use one of the many variations of DOE 2 software. Additional information on documenting code compliance is included at the end of this chapter.

## Systems Analysis

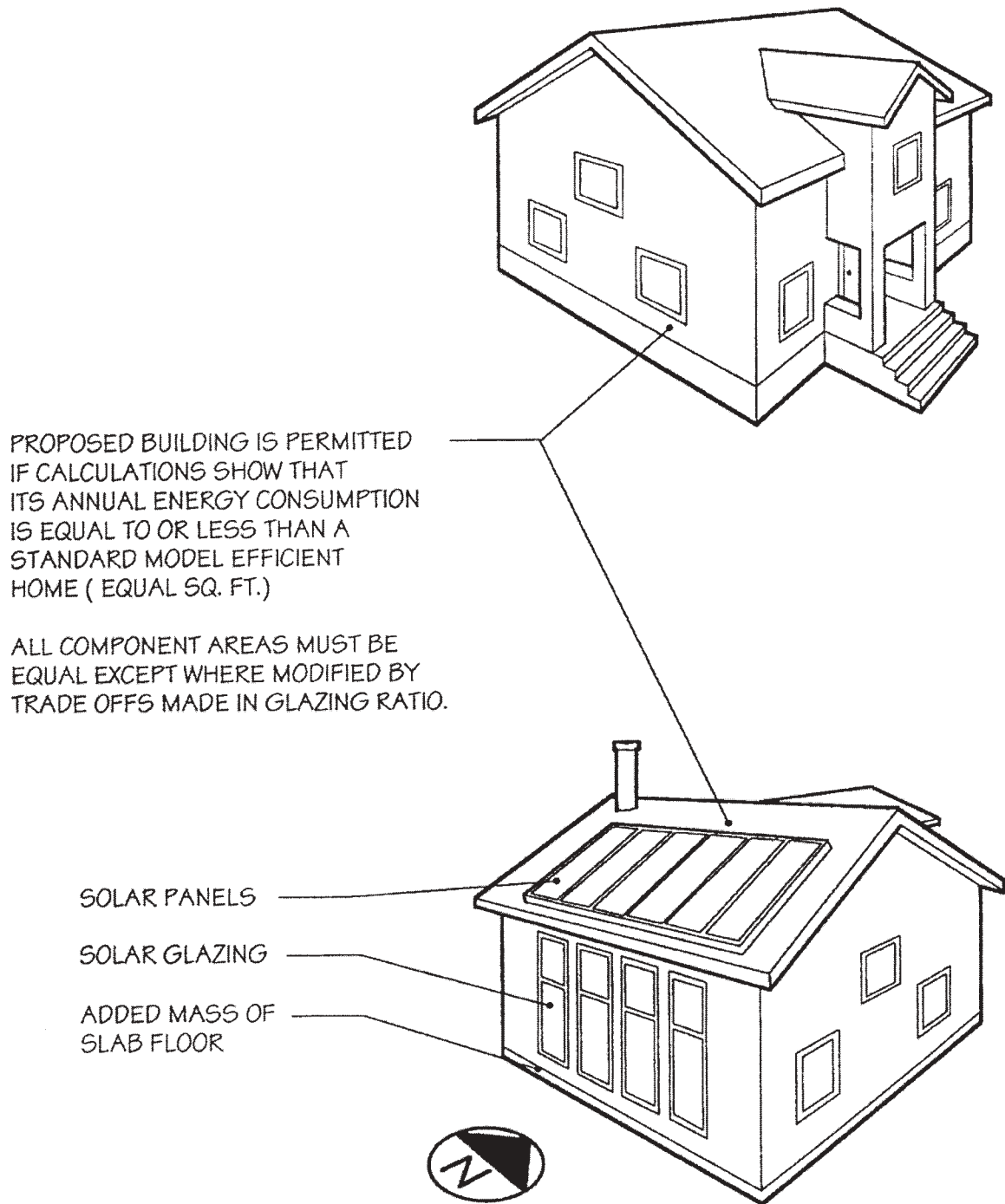


Figure 1.4

## Documenting Code Compliance

To obtain a building permit you will be required to provide the local building department with a description of the Energy and Ventilation Code compliance approach that will be used. To show compliance it is recommended that you use standardized forms and spread sheets developed by WSU Energy Program.

### The Prescriptive Approach

For the Washington State Energy Code, the prescriptive approach is the simplest method of code compliance. However, depending on the prescriptive option and exceptions used, documentation of compliance can be quite complex. You have an option of using a simple approach, or a detailed approach.

#### Which Prescriptive Worksheet should I use?

There are two different forms for documenting prescriptive code compliance. The Simple Worksheet documents compliance using the unlimited glazing option, with little to no math. The Detailed Worksheet, described in these instructions, provides the tools to document compliance using other options, and the more complex exceptions.

The Simple Worksheet:

- For single family and duplex dwellings only.
  - Includes the unlimited glazing option only.
  - One door, 24 square feet or less does not need to meet the code.
- [602.6 exception 1]
- Doors may qualify as vertical glazing.
- [602.6 exception 2]

The Detailed Worksheet:

- For all residential building types.
- Includes all prescriptive options.
- Requires completion of detailed door and glazing schedules and calculation of conditioned floor area.
- Area weighted U-factors for glazing and doors included.



- One door, 24 square feet or less does not need to meet the code.
- [602.6 Exception 1]
- Doors may qualify as vertical glazing
- [602.6 Exception 2]
- Single glazing and garden window exception
- [602.7.2,Exception]

### Component Performance Approach

The WSU Energy Program developed a package of Excel worksheets designed to document the qualification of building designs by the component performance approach described in Chapter 5 of the WSEC. Individual CPWorksheets were developed for each climate zone and fuel type. An additional worksheet that provides the needed component libraries is also provided. All of the worksheets can be downloaded as a set from the WSU Energy Program website:

<http://www.energy.wsu.edu/buildings>

### Systems Analysis Approach

The WSU Energy Program no longer provides software that supports a systems analysis approach. Select a DOE 2 based software package for this type of analysis. Use the WSU component performance worksheet to develop a the target and proposed building envelope required by the code. Then load this information into a DOE 2 product and perform the systems analysis. For a complete list of DOE 2 compliant software available, visit:

<http://gundog.lbl.gov>

## Foundation Vent

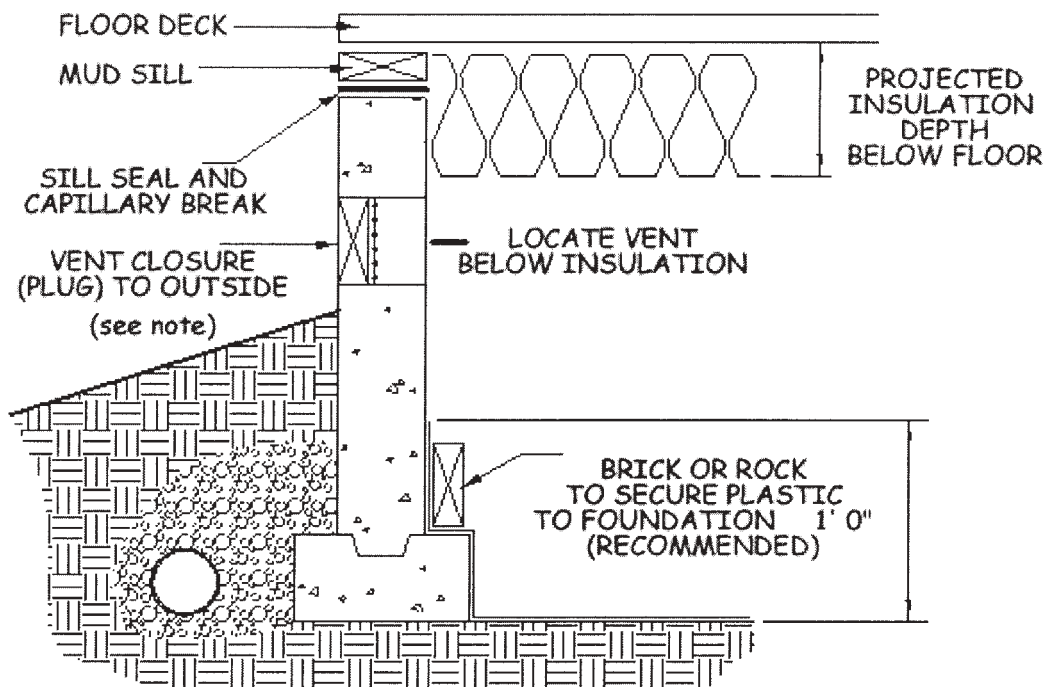


Figure 2.1

**Note:**

If foundation vents are closed, a radon vent stack is required.

## Slab Construction Perimeter Insulation

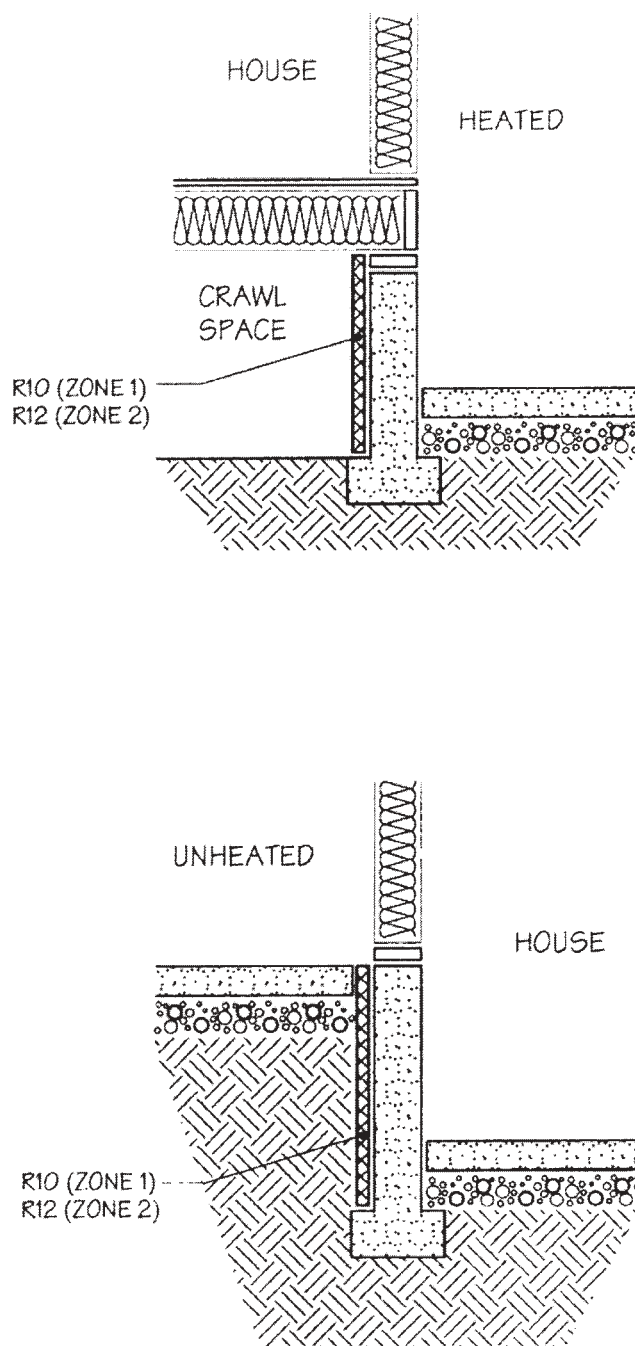
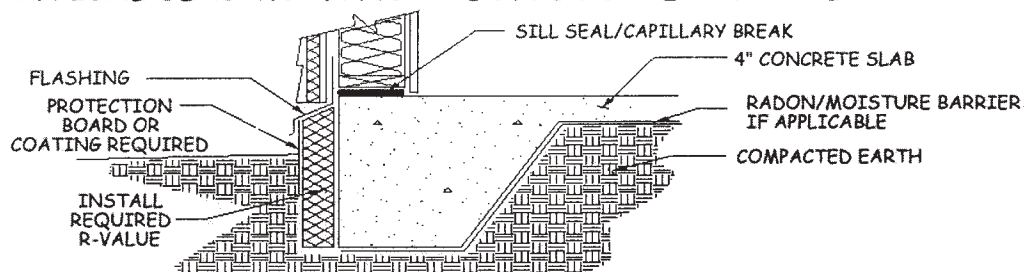


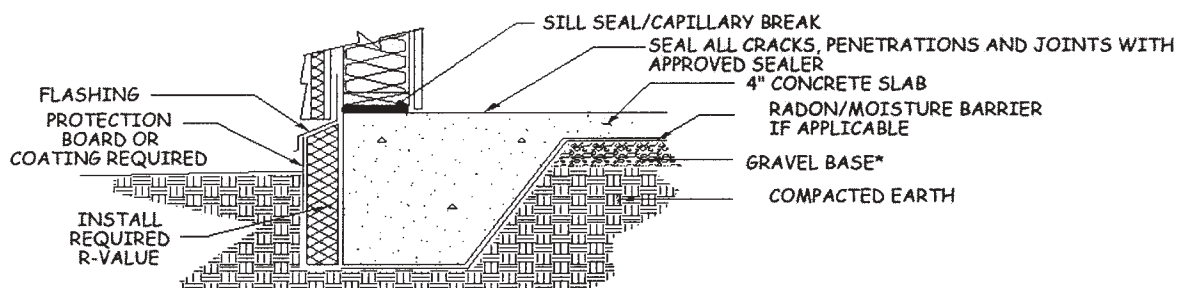
Figure 2.4

## Monolithic Slab-On-Grade

## TYPICAL SLAB WITH NO RADON SOURCE CONTROL



## SLAB WITH RADON SOURCE CONTROL



## RADIANT SLAB WITH RADON SOURCE CONTROL

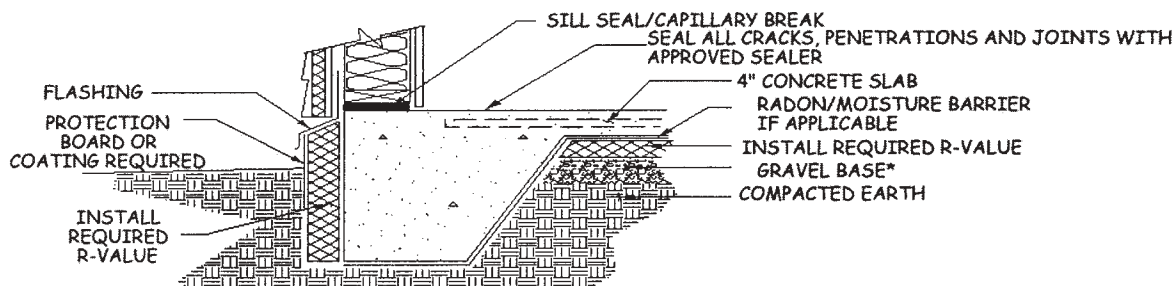


Figure 2.6

Note: See VIAQ 503.2.4 for new membrane requirements in radon counties.



## Heated Basement: Exterior Insulation

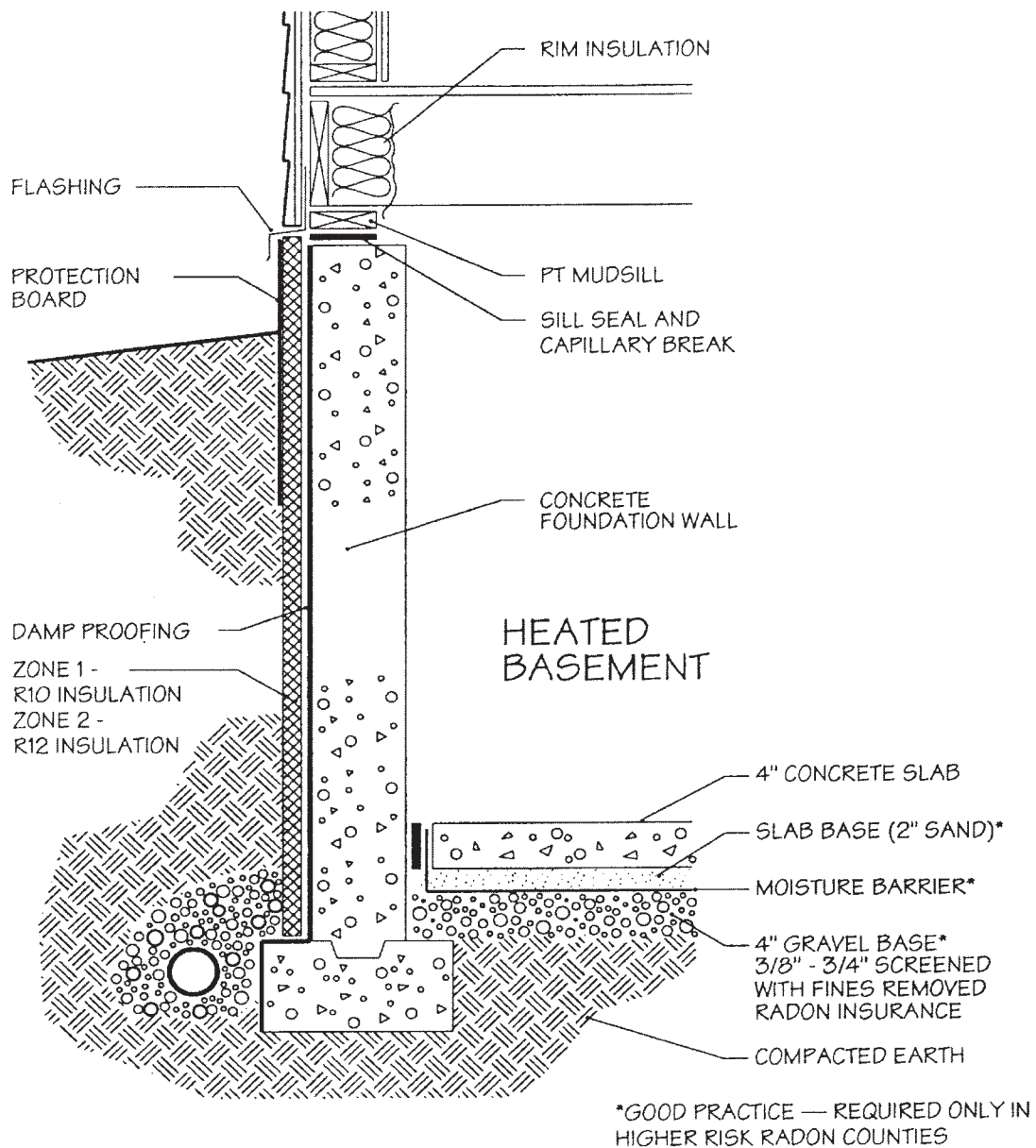


Figure 2.10

## Plumbing

The WSEC sets standards that minimize heat loss and conserve water.  
(See Figure 6.1.)

### Plumbing Requirements

WATER CONSERVING  
SHOWER AND LAVATORY  
FIXTURES REQUIRED

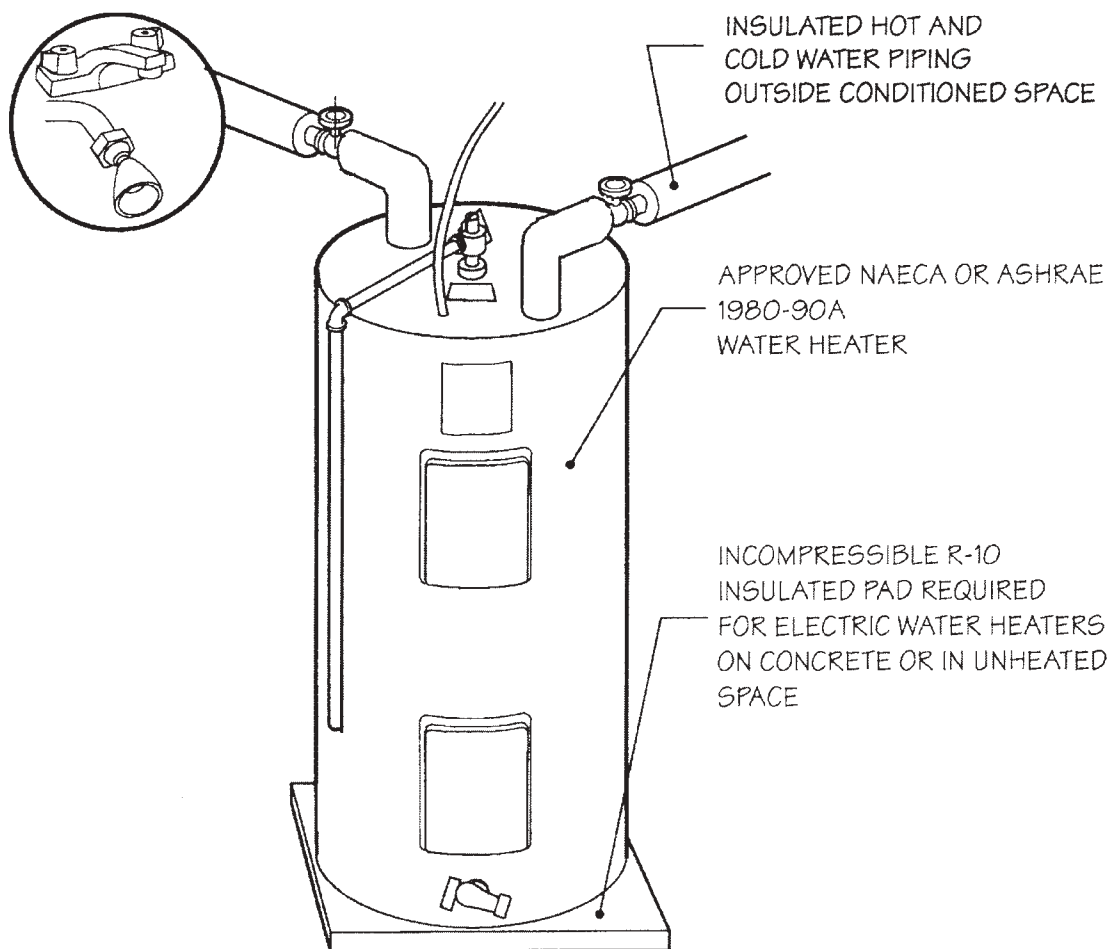


Figure 6.1

## MECHANICAL VENTILATION SYSTEMS REQUIRED

The Washington State Ventilation and Indoor Air Quality Code (VIAQ) requires new residential structures be provided with both source-specific and whole-house ventilation systems. There are two methods for meeting this code. Section 302 provides requirements for residential ventilation systems using performance or design qualification methods. Section 302 will most likely be used by mechanical engineers on complex projects and systems designed for continuous operation. Section 303 provides prescriptive direction for spot ventilation and four prescriptive options for intermittent operation whole house ventilation systems. This guide will only cover the section 303 prescriptive paths.

Prescriptive Paths Include:

- [V303.3]
  - Source Specific Ventilation (all prescriptive paths)
- [V303.4.1]
  - Whole House Ventilation Using Exhaust Fans
- [V303.4.2]
  - Whole House Ventilation Integrated with a Forced Air Heating System
- [V303.4.3]
  - Whole House Ventilation Using a Supply Fan
- [V303.4.4]
  - Whole House Ventilation Using a Heat Recovery Ventilation System

[V303.4.1]

**Whole House Ventilation Using Exhaust Fans**

[V303.4.1.1]

In addition to the requirements listed above, whole house ventilation using exhaust fans must comply with requirements for fan ratings, sound control, duct sizing, insulation, and outdoor air inlets (see figure 8.2.)

**Fan Rating**

[V303.4.1.2]

VIAQ Table 3-2 shows two exhaust rates, expressed in Cubic Feet per Minute (CFM). Fan CFM are to be rated at 0.25 inches water gauge. This rating is included on the manufacturers fan curve. The CFM rating on the fan carton is usually the rating at the lower pressure of 0.10 and does not meet the requirements of the VIAQ.

To identify products that meet the VIAQ standards, use the Home Ventilating Institute's Directory of Certified Products. The directory is certified monthly, and can be obtained from:

<http://www.hvi.org>

**Fan Noise**

The whole-house fan must be quiet when operating. Fan noise is rated in "sones." The VIAQ allows a 1.5 sone maximum when the fan motor is installed within 4 feet of the interior pick-up grille. Remote-mounted fans (more than 4 feet from the pick-up grille) are exempt from the sound rating requirement. (See Figures 8.3 and 8.4.)

## Whole House Exhaust Ventilation

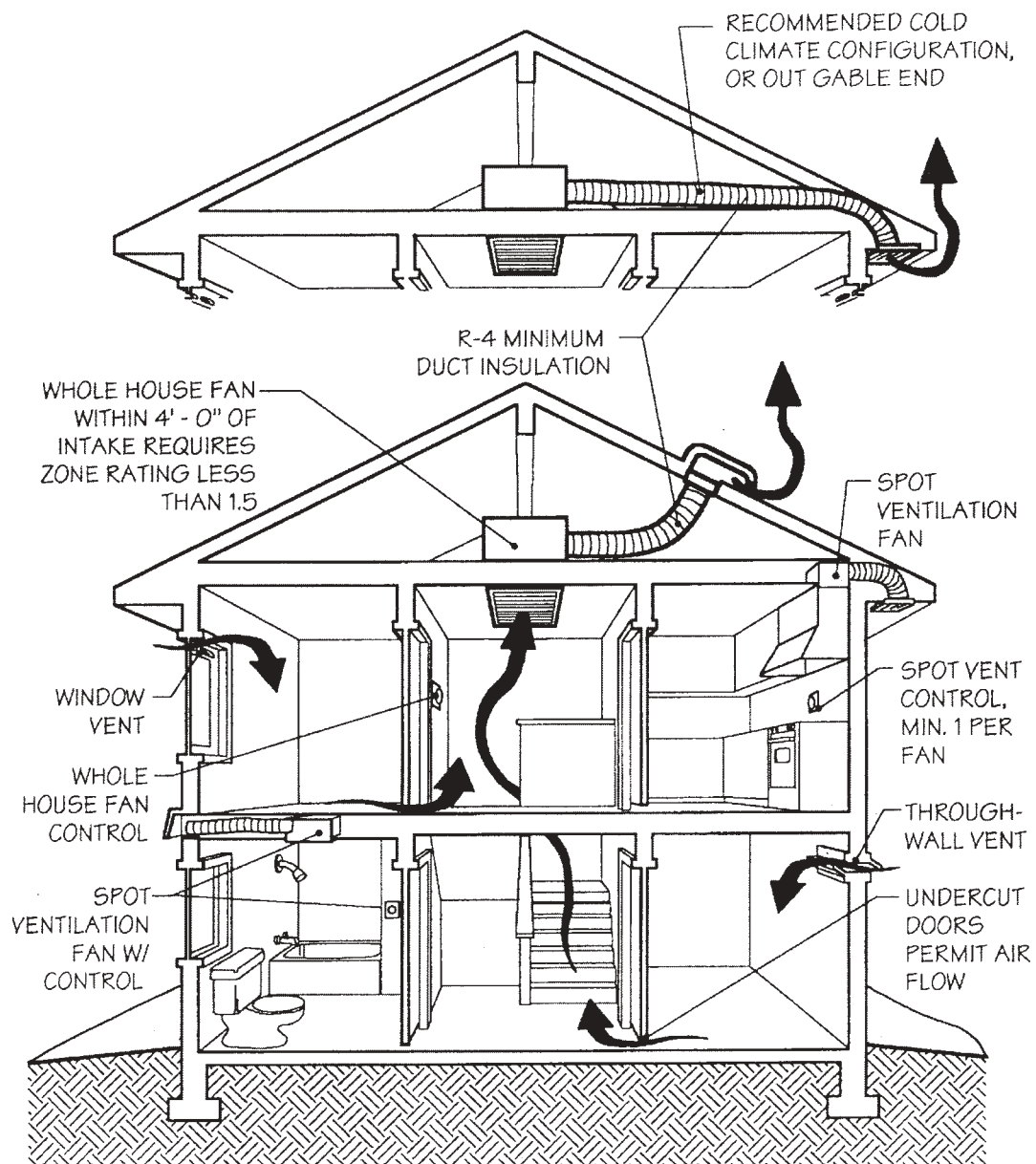


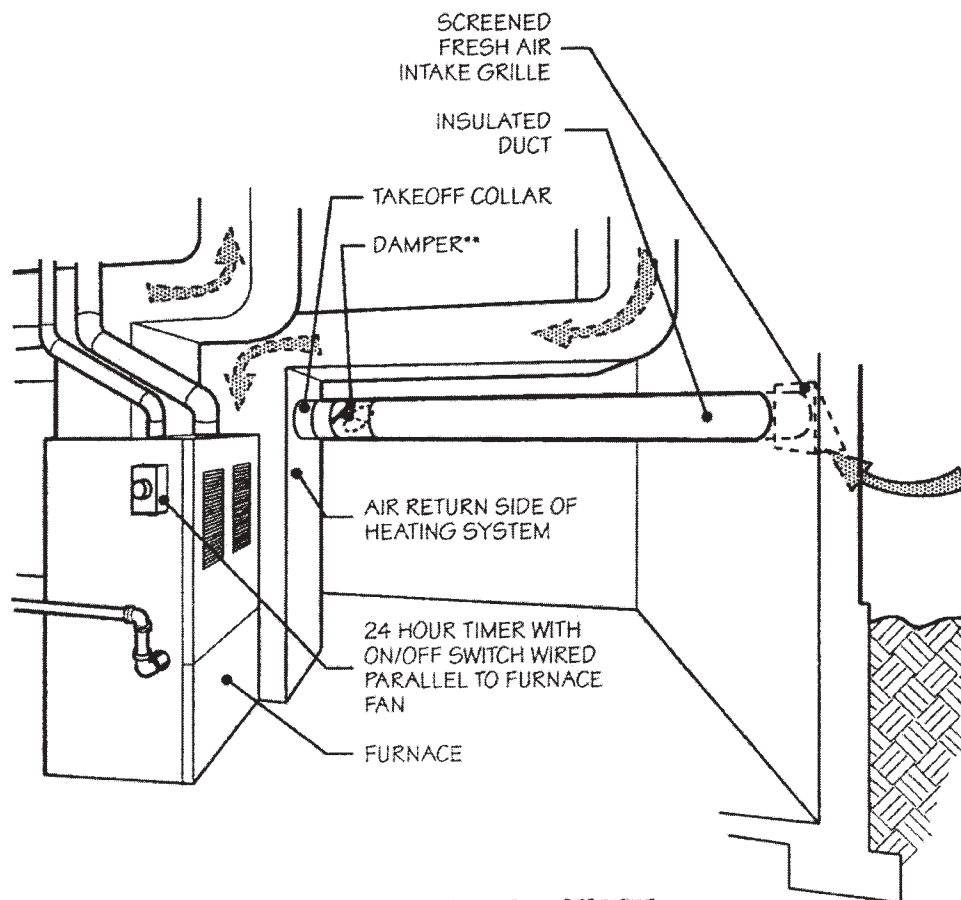
Figure 8.2

**Integrated Ventilation System:** If a forced air heating system is installed, fresh air may be ducted into the system to meet ventilation requirements. (See Figures 8.9, and 8.12a and 8.12b.) An integrated system consists of:

[V303.4.2]

- A fresh air duct, connected to the furnace return plenum, sized per VIAQ Table 3-5.
- A damper allowing the proper amount of outside air to the system.
- A clock timer set to appropriate ventilation periods.

### Integrated Ventilation



\*\*MANUAL DAMPER REQUIRED. MOTORIZED DAMPER RECOMMENDED IN SOME LOCATIONS.

Figure 8.9

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C l a r k C o u n t y





## Reference Material

**GENERAL REQUIREMENTS**

This information is considered part of the plan review. Building inspections **SHALL NOT** be provided without approved plans on the job site. The permit/inspection card shall be posted on site at time of inspections. This review does not imply approval of any construction which does not comply with the Uniform Building Code. The following items are brief summaries of the appropriate Building Code language. This is a partial list of common code items.

**FOOTINGS AND FOUNDATION: (Chapter 4 IRC)**

Presumptive soils load bearing pressure is 1,500 pounds per square foot. Frost depth is 12-inches

Minimum compressive strength for concrete foundations is 2,500 PSI. Concrete footings and foundations require a minimum of grade 60 reinforcing steel. A minimum of one #4 rebar in footing and one #4 rebar in the upper 12 inches of the stem-wall. For slab on grade with footing cast separately, one #4 bar is required at the top and bottom of footing. Interior or exterior footings cast monolithically with slab shall be a minimum of 18-inches in depth below the top of the slab and be provided with one #5 bar or two #4 bars in the middle 1/3 of the footing depth. Where a construction joint is created between a footing and stem wall, a #4 rebar shall be provided at a maximum of 4 foot on center extending a minimum of 14-inches into the stem wall to 3-inches from the bottom of the footing with a standard 6-inch hook.

Foundation plates or sills shall be bolted as required by Section (R403.1.6.1). Minimum 7 inch embedment in concrete or masonry with ½ inch anchor bolts spaced a maximum of 6'-0" on center, and within 12" of each corner, minimum 2 bolts per piece, with nuts and washers and 3" by 3" by 1/4 inch thick plate washers. Exception: The maximum bolt spacing shall be 4-feet for buildings over two stories in height. Min. stem wall 6" up to 4'-0" high.

Footings: 1-story 6"x12", 2-story 6"x15" and 3-story 8.5"x23". Where a construction joint is created between the footing and stem-wall Provide #4 vertical @ 48" o.c. min. extending to within 3" from bottom of footing and min. 14" into stem-wall with a standard hook.

Foundation walls over 4' high are required to be constrained in an approved manner and meet the requirements of Tables R404.1.1(2), R404.1.1(3) or R404.1.1(4) or provide engineering and shall have 2-#4 bars located in the upper 12 inches of the wall.

Foundation ventilation requires 1 square foot of vent per 150 square feet of under-floor area. Openings shall be as close to corners as possible and shall provide cross ventilation.

Provide ground cover of 6-mil black polyethylene or equivalent in crawl space. (Energy Code Section 502.1.6.7)

Provisions shall be made for the control and drainage of surface water away from the building. The grade shall slope a minimum of 6-inches in 10 feet away from the building. Every crawl space shall be provided with a 3-inch low point drain.

rains shall be provided all around foundations that retain earth and enclose habitable or usable spaces located below grade per R405.

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**FLOORS: (Chapter 5 IRC)**

Wood in direct contact with concrete shall be pressure treated or other approved material. Minimum clearance of 12 inches under beams, 18 inches under joists, required in crawl space. Joists, beams, or girders shall bear 1.5 inches on wood and 3 inches on masonry or concrete (R502.6)

Joists, beams or girders entering into concrete shall be P.T. or provided with a half-inch air space around ends, sides, and tops. (R319.1) Holes bored in joists shall not be within 2 inches of the top or bottom of the joist and the diameter shall not exceed 1/3 the depth of the joist. (R502.8.1)

Provide an 18 by 24 inch access through the floor or a 16 by 24 inch access through a perimeter wall. When the through wall access is below grade provide a minimum of a 16 by 24 inch area way. The bottom of the areaway shall be below the threshold of the access opening.

Fastening positive connections shall be provided to ensure against uplift and lateral displacement. (R502.9)

Decks shall be positively anchored to structures with lags. (R319.1)

**WALLS: (Chapter 6 IRC)**

Wood-frame walls subject to water splash shall be protected with approved material. (R319.1) Maximum diameter for holes bored in bearing wall studs is 40 percent (60 percent in non-bearing wall studs) of stud thickness Maximum notching in bearing wall studs is 25 percent of stud thickness (40 percent in non-bearing partitions). (R602.6)

Top plates permitted to be notched 50% max, then shall be strapped with a 1-1/2" steel strap with (8) 16d's each side of notch.(R602.6.1) Walls- maximum height for bearing walls using 2x4 or 2x6 studs at 16" o.c. is 10'.

**ROOF FRAMING: (Chapter 8 IRC)**

Rafters shall be provided full bearing on the ridge board the depth of the cut rafter. Hips and valley rafters shall be supported at the ridge by a brace to a bearing partition or designed to carry the specified loads. (R802.3)

Rafters and ceiling joist exceeding a ratio of 5:1 (2x10) shall be laterally supported at bearing points. (Section R802.8)

Rafters permitted to be notched to width of D/3 max x D/6 on end thirds only; rafter end cuts permitted to depth of D/4 max.; and borings permitted D/3 with 2 inches to edges. (R802.7)

Rafters and trusses shall be provided with approved connectors to resist uplifts. (R802.10.5) Truss identification is required on each truss.

**ROOFS: (Chapter 8 IRC)**

Composition roof shingles must be a minimum of 25-year life shingles manufactured to ASTM 3462 and installed per the manufacturer's installation specifications. Attic ventilation must be 1/150th of the attic area or 1/300th of attic area if at least 50 percent but not more than 80 percent of the required ventilation is 3 feet above the eave or cornice vents or provide a moisture barrier on the warm

side of the ceiling. (R806.2)

Provide a readily accessible attic opening to all areas with 30 square feet or more and has 30 inches or more of vertical height. The rough framed opening shall be not less than 22 by 30 inches with a minimum of 30 inch of headroom provided at some point above the opening. (R807)

#### **INTERIOR:**

**LIGHT AND VENTILATION:** Provide natural light and ventilation by means of windows and or skylights equal to eight percent of habitable room areas, ½ of which can be opened. Exception; An approved mechanical system capable of supplying outdoor air at 15 CFM per person computed at two persons for the first bedroom and one for each additional bedroom can be substituted for natural ventilation. Artificial light can be substituted for glazed area provided it is capable of producing an average illumination of 6 foot candles over the area of the room at a height of 30" above the floor level. (R303)

**VENTILATION:** Provide mechanical ventilation in bathroom, and laundry rooms (50 cfm at .25 WG) and kitchens (100 cfm at .25 WG.) See the Washington State Indoor Air Quality Code. Outside air is required to be supplied to each habitable room, at a min. of 15 cfm for each area. Individual room outdoor air inlets shall be through vented windows or through the wall ports providing not less than four square inches of net free area of openings for each habitable space. (WAC51-13 302.6.2). Whole house ventilation system required per WAC51-13 section 302.5 and Table 3-2 with a sone rating of 1.5 (302.4) or integrated force-air ventilation system option per WAC 51-13 (303.1.2).

**DRYER VENT: (IRC M1501.3)** Maximum length of duct is 25 ft. The length of duct shall be reduced 2.5 ft for every 45-degree bend and 5 ft for every 90-degree bend. The transition duct length is not included. (M1501.3)

**EMERGENCY EGRESS:** Provide an emergency escape and rescue window with a minimum net clear opening of 5.7 square feet, a minimum height of 24 inches, a minimum width of 20 inches with sill not more than 44 inches above the floor, or an exterior door for emergency exit from sleeping room or basements. Exception; Grade floor openings may have a minimum net clear opening of 5 square feet. Section R-310.1 and 310.1.1 Emergency egress openings with sill height below adjacent grade shall be provided with window wells (R310.2).

**SMOKE ALARMS:** Dwellings are required to have smoke alarms in each sleeping room, in the area leading to each sleeping room, and on each building level. Alarms shall be powered by house current with battery backup. Place detector in high area of ceiling, when it is 24-inches or more above bedroom hallway. Battery operated smoke detectors are required for existing homes when doing additions or interior alterations to existing homes. They shall be located as required for new dwellings. Smoke detectors are required to be interconnected and hard wired when accessible without removing the interior wall covering. (313.1 and 313.1.1 IRC)

**SAFETY GLAZING: (Section R308 IRC)** Safety glazing required in all hazardous locations. See section R308.4 for complete list of hazardous locations. Shower doors and bathtub doors shall have tempered laminated safety glass or approved plastic glazing. Glazing at hot tubs and spas when less than 60-inches above a walking surface and within 60-inches horizontally of the waters edge. (For single glazing and both panes in multiple glazing). A walking surface when within 18 inches of a floor, with panels over 9 sq.ft, with an exposed edge over 36 inches above the floor. Glazing in all

doors within 24 inches, and on the same plane as the wall, and within 5 ft of the floor. Glazing in stairways and ramps when within 36-inches horizontally, and less than 5 ft above the plane of the walking surface. Glazing adjacent to a stairway, within 60-inches of the bottom tread in any direction when the bottom edge of the glass is less than 60-inches above the nose of the tread.

**STAIRWAYS: (R311.5)** Minimum stair width shall be 36 inches. Handrail height required to be minimum 34" to 38" maximum, measured perpendicular from the nosing. The minimum requirement for the ceiling height is 6-feet 8-Inches. Stairs shall have a  $7\frac{3}{4}$  inch maximum rise and a 10-inch minimum run per section. The riser height or tread depth shall not exceed the smallest by more than  $\frac{3}{8}$  inch. Winder treads shall have a minimum tread depth of 10-inches measured at 12-inches from the narrowest side which shall be a minimum of 6-inches in depth. There shall be a floor or landing at the top and bottom of every stairway. A nosing of not less than  $\frac{3}{4}$  inch but not more than  $1\frac{1}{4}$  inch shall be provided on stairways with solid risers. All interior and exterior stairways and landings shall be provided with a means to illuminate per section (R311.5.6). The controls for interior stairway lighting shall be accessible at the top and bottom of each stairway without traversing any steps. Exterior stairway lighting shall be controlled from inside the dwelling unit. Enclosed accessible space under stairs shall be protected by  $\frac{1}{2}$  inch gypsum board installed on the enclosed side of walls and soffits.

**HANDRAILS: (R311.5.6)** Handrails are required on one side of every stairway with four or more risers. Handrails may project a maximum of 4.5 inches from each side and a minimum clear width at the handrail height, including the treads and landings shall be not less than 31.5 inches where one handrail is installed and 27-inches where handrails are installed on both sides. Handrails shall be continuous from a point directly above top riser to a point directly above the bottom riser. Handrail ends shall be returned or shall terminate in newel posts. Handrail height shall be not less than 34inches, and not more than 38-inches, from top of rail to the nosing of the stair treads per (R11.5.6.1). Grip size for circular handrails shall be a minimum of  $1\frac{1}{4}$ -inches and not greater than 2-inches outside diameter and not allow passage of a sphere  $4\frac{3}{8}$  inches in diameter. Ramp handrails shall be as required for stairs. Refer to section (R311.5.6.) for handrails of different shapes and additional information.

**GUARDRAILS: (R312)** Guardrails are required at every stair, floor, or landing 30-inches or more above grade or floor. Guardrails shall be a minimum of 36 inches in height. Guardrails shall have intermediate rails or an ornamental pattern such that a 4-inch diameter sphere cannot pass through. Exception: A guard rail on open stairs shall have intermediate rails spaced such that a 4 inch sphere cannot pass through. (Section R311.2)

**DOORS: (R311)** One exit door required for each dwelling unit per section (R311.4.1.) Exit door shall be side-hinged, not less than 3 feet wide and 6-feet 8-inches high. (R311.4.2)

**LANDINGS AT DOORS:** The landing or floor required at the exit door shall not be more than 1.5 inches below the top of the threshold. (R311.4.3) Landings at other exterior doors may be two (maximum of  $7\frac{3}{4}$ " ) risers below the threshold. A floor or landing is not required at the top of an interior flight of stairs, provided a door does not swing over the stairs. (R311.5.4)

**HALLWAY:** Hallway minimum width is 36 inches per (R311.3)

**GARAGE SEPARATION: (R309.2)** Provide a 1-3/8 inch minimum solid-core wood, steel door, honeycomb steel door, or labeled 20-minute fire-rated door between garage and living area. The garage shall be separated from the residence and its attic by not less than ½-inch gypsum board applied on the garage side. With any living area above, the separation from that living area shall be with 5/8 type X gypsum board. The 5/8-inch gypsum board installed on a ceiling under habitable areas shall be installed perpendicular to the ceiling framing and fastened at 6-inches o.c. with 1 7/8-inch coated 6d drywall nails or equivalent. Where the separation is a floor-ceiling assembly, the structure supporting the separation shall be protected by not less than ½-inch gypsum board. Doors opening directly into a sleeping room are not permitted. (Section R309.1 and R309.2)

**MISCELLANEOUS:**

In garages, all appliances shall be protected from auto damage.

Water heaters and fixed appliances shall be anchored or strapped. (See UPC 510.5 UMC 308.1.)

Water closets shall have a minimum of 30 inches of net clearance, side wall to side wall, and at least 21 inches of clearance in front..

Fireplace reinforcement is required. (Section R1003.3)

Install positive ties at beam-to-column intersections and footing-to-column intersections per Section

Wood stoves and fireplaces must have tightly-fitted flue dampers operated with a readily accessible manual control and a direct connection to outside combustion air. Tight-fitting doors are required on solid fuel burning appliances.

Separate permit is required for all wood stoves.

Separate permit is required for lawn sprinklers.

See additional basic code requirements on the "Informational Builders Checklist" located on the Clark County Website ([www.clark.wa.gov](http://www.clark.wa.gov)) or, a hand-out is available at the Customer Service Division in the Public Service Center, 1300 Franklin, Vancouver, WA.